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ABSTRACT

This report analyzes vocational/technical (VT) course taking among public high school graduates between 1982-98. It focuses on trends in VT course taking, introductory technology and computer-related coursetaking, and how students combine VT and academic course taking. The report examined high school transcripts for the graduating classes of 1982, 1990, 1992, 1994, and 1998. Findings indicated the average number of VT credits earned by graduates declined between 1982-90, with no subsequent statistically significant changes; program areas with declining course taking were materials production, business management, and mechanics and repair, and those with increasing course taking were computer technology and communications technology; students were less likely to concentrate in occupational education; differences were not significant in the percentage of 1982 and 1998 graduates taking work-based learning courses or the average number of credits earned; some evidence showed, in states that increased graduation requirements, students decreased VT course taking; 1998 graduates earned credits equivalent to about one full-year computer-related course; graduates increased the number and rigor of academic courses they took; and students became more likely to combine college preparatory and occupational coursework. The text and appendixes contain 113 tables and 67 figures, a glossary and technical notes and methodology. (YLB)

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DATA ON
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Trends in High School Vocational/Technical Coursetaking: 1982–1998

Statistical Analysis Report

U.S. Department of Education
Institute of Education Sciences
NCES 2003-025

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Trends in High School Vocational/Technical Coursetaking: 1982-1998

Statistical Analysis Report

June 2003

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Executive Summary

Vocational/technical education is a common component of public high school education in the United States. Among 1998 public high school graduates, 96.5 percent earned at least some credits in vocational/technical education in high school. In addition, the number of credits earned in vocational/technical education by 1998 graduates was not significantly different on average from the number of credits they earned in English and in social studies, and they earned more credits in vocational/technical education than they did in mathematics, science, fine arts, or foreign languages.

Purpose of the Report

This report examines vocational/technical coursetaking among public high school graduates between 1982 and 1998. The report focuses on trends in vocational/technical coursetaking overall, in introductory technology and computer-related coursetaking, and in the ways in which high school students combine vocational/technical and academic coursetaking. The report analyzes these trends by examining high school transcripts for the graduating classes of 1982, 1990, 1992, 1994, and 1998.[1] Transcripts provide information on the courses that graduates took in grades 9 through 12. For simplicity's sake, the report refers to this information as "high school coursetaking." With the exception of the section on vocational/technical coursetaking by grade level, which examines coursetaking in each of grades 9 through 12 separately, the report describes the cumulative coursework that graduates took in high school. The report uses the National Center for Education Statistics (NCES) Secondary School Taxonomy (SST) to classify courses into broad course groupings. As figure A shows, the SST classifies high school courses into three main areas (academic, vocational/technical, and enrichment/other) and their curricular subareas.

The Vocational/Technical Curriculum

High school vocational/technical education encompasses three subcurricula: specific labor market preparation or "occupational education," general labor market preparation, and family and consumer sciences education (figure A). Occupational education consists of courses that teach skills and knowledge required in a particular occupation or set of related occupations. Based on SST classifications, occupational education in this report consists of the 10 broad and 18 narrow program areas shown in figure A.

General labor market preparation consists of courses that teach general employment skills that are not specific to one occupational area, such as basic typewriting/keyboarding, introductory technology education, and career preparation and general work experience courses. Family and consumer sciences education consists of courses intended to prepare students for family and consumer roles outside of the paid labor market.[2]

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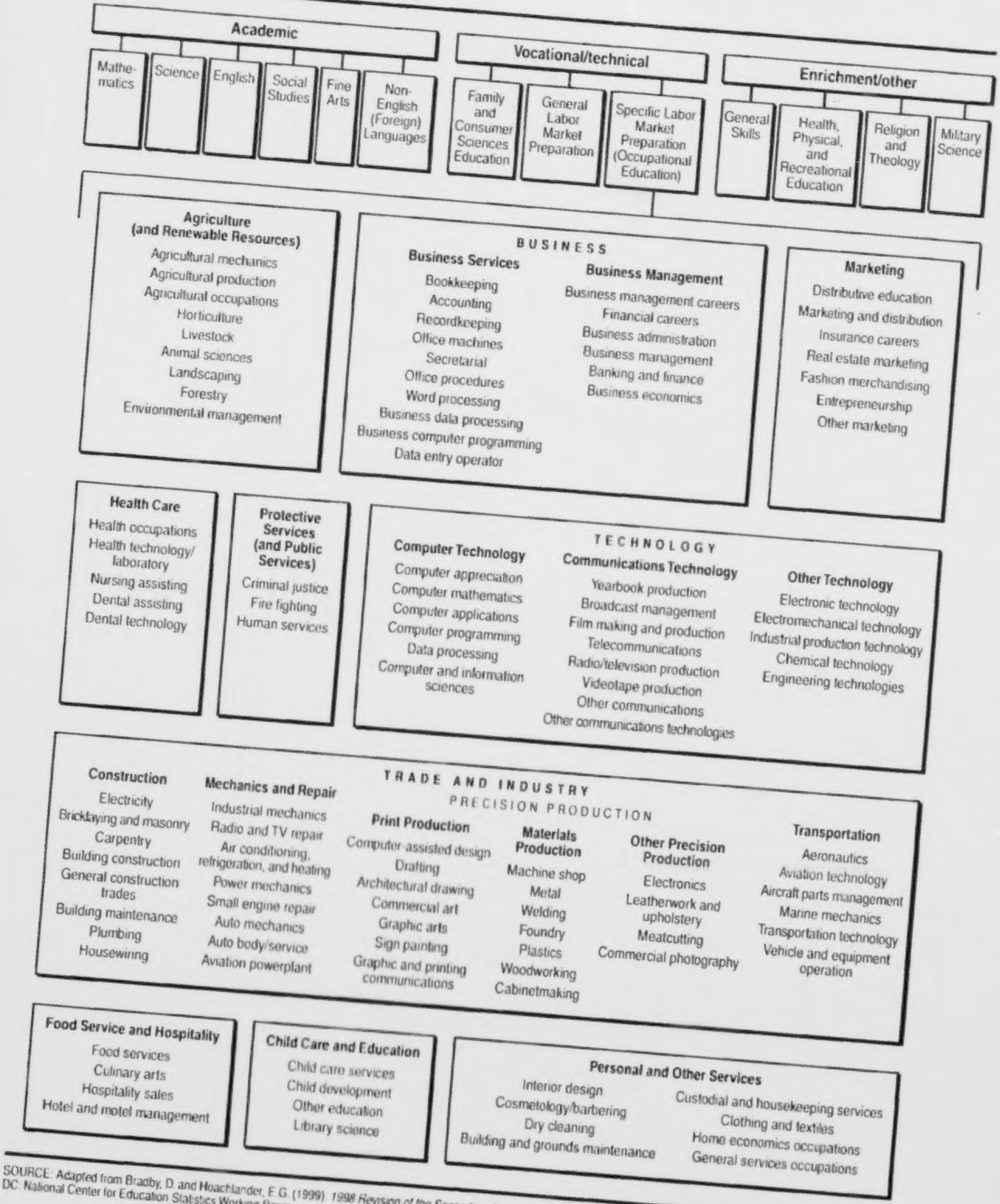
[1] These transcript studies were conducted as part of the High School and Beyond (HS&B) Sophomore Cohort Study (1982 graduates), the National Education Longitudinal Study of 1988 (NELS, 1992 graduates), and the High School Transcript Study (HSTS) of 1990, 1994, and 1998 (1990, 1994, and 1998 graduates, respectively).

[2] Home economics-related courses that prepare students for the paid labor market are included under occupational education, in the child care and education, food service and hospitality, and personal and other services program areas.

Figure A. Secondary school taxonomy


Academic
Mathematics
Science
English
Social Studies
Fine Arts
Non-English (Foreign) Languages
Vocational/technical
Family and Consumer Sciences Education
General Labor Market Preparation
Specific Labor Market Preparation (Occupational Education)
Enrichment/other
General Skills
Health, Physical, and Recreational Education
Religion and Theology
Military Science
Agriculture (and Renewable Resources)
Agricultural mechanics
Agricultural production
Agricultural occupations
Horticulture
Livestock
Animal sciences
Landscaping
Forestry
Environmental management
BUSINESS
Business Services
Bookkeeping
Accounting
Recordkeeping
Office machines
Secretarial
Office procedures
Word processing
Business data processing
Business computer programming
Data entry operator
Business Management
Business management careers
Financial careers
Business administration
Business management
Banking and finance
Business economics
Marketing
Distributive education
Marketing and distribution
Insurance careers
Real estate marketing
Fashion merchandising
Entrepreneurship
Other marketing
Health Care
Health occupations
Health technology/laboratory
Nursing assisting
Dental assisting
Dental technology
Protective Services (and Public Services)
Criminal justice
Fire fighting
Human services
TECHNOLOGY
Computer Technology
Computer appreciation
Computer mathematics
Computer applications
Computer programming
Data processing
Computer and information sciences
Communications Technology
Yearbook production
Broadcast management
Film making and production
Telecommunications
Radio/television production
Videotape production
Other communications
Other communications technologies
Other Technology
Electronic technology
Electromechanical technology
Industrial production technology
Chemical technology
Engineering technologies
TRADE AND INDUSTRY
Construction
Electricity
Bricklaying and masonry
Carpentry
Building construction
General construction trades
Building maintenance
Plumbing
Housewiring
Mechanics and Repair
Industrial mechanics
Radio and TV repair
Air conditioning, refrigeration, and heating
Power mechanics
Small engine repair
Auto mechanics
Auto body/service
Aviation powerplant
PRECISION PRODUCTION
Print Production
Computer-assisted design
Drafting
Architectural drawing
Commercial art
Graphic arts
Sign painting
Graphic and printing communications
Materials Production
Machine shop
Metal
Welding
Foundry
Plastics
Woodworking
Cabinetmaking
Other Precision Production
Electronics
Leatherwork and upholstery
Meatcutting
Commercial photography
Transportation
Aeronautics
Aviation technology
Aircraft parts management
Marine mechanics
Transportation technology
Vehicle and equipment operation
Food Service and Hospitality
Food services
Culinary arts
Hospitality sales
Hotel and motel management
Child Care and Education
Child care services
Child development
Other education
Library science
Personal and Other Services
Interior design
Cosmetology/barbering
Dry cleaning
Building and grounds maintenance
Custodial and housekeeping services
Clothing and textiles
Home economics occupations
General services occupations

SOURCE: Adapted from Bradby, D. and Hoachlander, E.G. (1999). *1998 Revision of the Secondary School Taxonomy* (NCES 1999–06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

As of 1998, 90.7 percent of public high school graduates had earned credits in occupational education in high school, 58.8 percent in general labor market preparation, and 44.4 percent in family and consumer sciences education.

Key Measures of Participation

Seven measures were used to define participation in vocational/technical education:

- *Vocational/technical coursetakers:* Graduates earning more than 0.0 credits in vocational/technical education in high school. All of the following groups of students are subsets of this group.
- *Occupational coursetakers:* Graduates earning more than 0.0 credits in occupational education in high school. This measure is a subset of the previous measure.
- *Vocational/technical investors:* Graduates earning 3.0 or more credits in vocational/technical education in high school. All of the following groups of students are subsets of this group.
- *Occupational investors:* Graduates earning 3.0 or more credits in occupational education in high school, regardless of whether they concentrate their occupational coursetaking in a single program area. This measure is a subset of the previous measure.
- *Occupational concentrators:* Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas in figure A.[3] This measure is a subset of the previous measure. The report also provides information on graduates concentrating (earning 3.0 or more credits) in one of the 18 narrow occupational program areas in figure A.
- *Advanced occupational concentrators:* Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas in figure A, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.[4] This measure is a subset of the previous measure.
- *Advanced occupational concentrators with cooperative education:* Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas in figure A, with at least 1.0 cooperative education credit in that program area.[5] This measure is a subset of the previous measure.

Figure B shows the percentage of 1998 public high school graduates who fell within each participation measure. According to the least restrictive measure—the percentage of public high school graduates who were vocational/technical coursetakers—almost all 1998 graduates (96.5 percent) participated in the vocational/technical curriculum in high school. According to the most restrictive measure—the percentage of graduates who were advanced occupational concentrators with cooperative education—just 4.5 percent of 1998 graduates were counted as participating in vocational/technical education.

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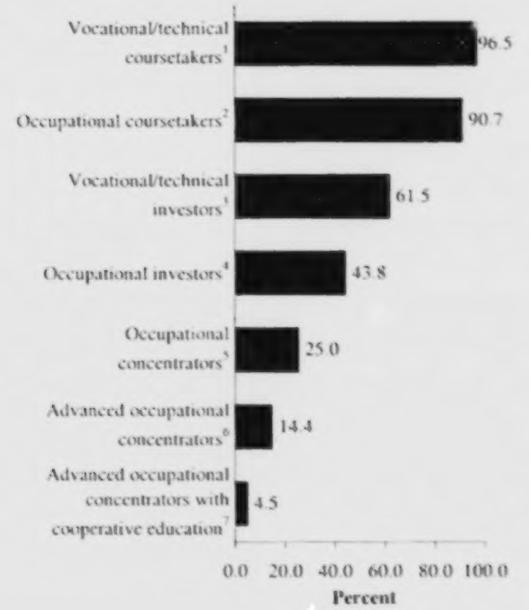
[3] In the small number of cases where graduates earned 3.0 or more credits in more than one occupational program area, they were assigned to the program area in which they earned the most credits.

[4] The SST divides the occupational courses in each program area into four categories: first-level, second- or higher-level, cooperative education, and specialty courses. The first three categories generally represent sequential coursetaking.

[5] Cooperative education awards school credit for work experience that is related to a student's occupational program and typically alternates work placements and classroom time.

Figure B. Percentage of public high school graduates meeting different measures of participation in vocational/technical education: 1998



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[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Overall Trends in Vocational/ Technical Coursetaking

Between 1982 and 1998, the primary change in vocational/technical coursetaking was not in the proportion of high school students participating in vocational/technical education but in the amount of vocational/technical education they took. That is, the breadth of vocational/technical coursetaking declined slightly, while the depth of this coursetaking declined more steeply. However, most declines in vocational/technical coursetaking occurred by the early 1990s.

The average number of vocational/technical credits earned by graduates declined between 1982 and 1990, after which there were no statistically significant changes. However, during the 1990s, vocational/technical credits continued to represent a declining share of the total high school credits that graduates earned. This relative decline was due to the fact that public high school graduates earned on average more academic credits and—to a lesser extent—more enrichment/other credits over this decade.

Trends in the Three Vocational/Technical Subcurricula

The decrease since 1982 in average vocational/technical credits earned by graduates was due primarily to a decrease in general labor market preparation coursetaking. Furthermore, this decline was due primarily to a decrease between 1982 and 1998 in the number of basic typewriting/keyboarding courses that graduates took in high school. The number of credits that graduates earned in family and consumer sciences education also declined over this period.

In contrast, there were no statistically significant changes between 1982 and 1998 in the average number of credits that graduates earned in occupational education in high school (about 3 credits for each graduating class). There was also no significant change between 1982 and 1998 in the breadth of occupational coursetaking, with most public high school graduates earning at least some occupational credits during the period studied.

Vocational/Technical Coursetaking by Grade Level

For the high school graduating class of 1998, the majority of vocational/technical coursetaking (about 60 percent) occurred in the 11th and 12th grades, while about 40 percent occurred in the 9th and 10th grades. Specifically, 1998 graduates earned 1.51 credits on average—the equivalent of about one and a half full-year courses—in the 12th grade. In contrast, 1998 graduates earned 1.01 credits in the 11th grade, 0.75 credits in the 10th grade, and 0.71 credits in the 9th grade.

The timing of occupational and family and consumer sciences education coursetaking was similar to that of overall vocational/technical coursetaking, with more of this coursetaking occurring in grade 12 than in earlier grades. However, general labor market preparation coursetaking was more likely to occur in grade 9.

Trends in occupational coursetaking varied at the different grade levels over the period studied. The average number of occupational credits earned by public high school graduates in the 11th grade decreased between 1982 and 1998, whereas the average number earned in the 9th grade increased. There were no statistically significant changes in the average number of occupational credits earned in the 10th and 12th grades. The reduction in occupational coursetaking in the 11th grade may be related to graduates taking additional academic courses in that grade over the period studied, thereby having less time for occupational coursework.

Trends in Occupational Coursetaking by Program Area

The average number of occupational credits that 1998 graduates earned in high school was not statistically different from the average number earned by 1982 graduates. However, the percentage of public high school graduates who concentrated in occupational education—those who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure A—declined from 33.7 percent in 1982 to 27.8 percent in 1990. No significant changes were detected after 1990, however, with about 25 percent of 1992, 1994, and 1998 graduates concentrating in occupational education. Trends in occupational coursetaking varied widely by program area, however. The following sections examine program area trends between 1982 and 1998 in the breadth of occupational coursetaking (that is, the percentage of graduates taking at least one course in a program area) and in the depth of occupational coursetaking (including both the average credits earned and the percentage of graduates concentrating in a program area).

Program Areas With Declining Coursetaking

Among the 18 narrow occupational program areas in figure A, the areas of materials production, business management, and mechanics and repair exhibited declines in both the breadth and depth of high school coursetaking over the period studied. For example, materials production exhibited declines between 1982 and 1998 in the percentage of public high school graduates who took at least one course in the program area, in the average number of credits earned by public high school graduates in the program area, and in the percentage of graduates who concentrated (earned 3.0 or more credits) in the program area. Declines in materials production and in mechanics and repair coincided with projected changes in occupational employment in precision production, craft, and repair occupations (Hurst and Hudson 2000).

Paralleling the trends in vocational/technical education and in occupational education noted above, the business services program area exhibited less change in the breadth of coursetaking than in the depth of that coursetaking. There was no statistically significant difference in the percentage of 1982 and 1998 graduates who earned business services credits in high school. In contrast, 1998 graduates earned fewer credits on average in business services than did 1982 graduates, and fewer public high school graduates concentrated (earned 3.0 or more credits) in business services over that period.

Declines between 1982 and 1998 in business services coursetaking were due primarily to declines in average credits earned in non-computer-related business services courses (including bookkeeping, accounting, secretarial, and general office procedures courses). In contrast, average credits earned in computer-related business services courses increased over the same period. Overall declines in business services coursework coincided with projections of below-average growth for secretary and typist occupations (Hurst and Hudson 2000).

Program Areas With Increasing Coursetaking

Two of the 18 narrow occupational program areas in figure A—computer technology and communications technology—generally exhibited increases in both the breadth and depth of coursetaking over the period studied. In addition, both health care programs and child care and education programs exhibited some increase in the depth—but not the breadth—of coursetaking over the period studied. To some extent, these increases in occupational coursetaking reflect projected changes in employment for technicians and related support occupations, health service occupations, and child care workers and teacher aides (Hurst and Hudson 2000).

A Closer Look at Trends in Occupational Concentrating

Between 1982 and 1998, high school students were less likely to concentrate in occupational education. However, the decline in occupational concentrating was not due to changes in the percentage of 1982 and 1998 graduates who earned 3.0 or more occupational credits (who were occupational investors) in high school. Rather, the decline reflected a change in coursetaking among these occupational investors. The percentage of occupational investors who concentrated in occupational education in high school—who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure A—declined from 72.8 percent in 1982 to 59.1 percent in 1992, after which no statistically significant changes were detected.

Additionally, the percentage of public high school graduates who completed an advanced occupational concentration in high school—occupational concentrators who earned at least 1.0 credit in advanced coursework in their program area—declined from 24.0 percent in 1982 to 16.1 percent in 1990, after which no statistically significant changes were detected. Part of this decline in advanced occupational concentrating among graduates was due to the fact that graduates were less likely to concentrate in occupational education in general over the period studied. However, the percentage of occupational concentrators who completed an advanced concentration in their program area also declined from 1982 to 1990, after which no statistically significant changes were detected.

In order to understand changes in coursetaking and concentrating in some detail, the report compared trends among the 18 narrow occupational program areas in figure A.

Shifts Away From Concentrated Occupational Coursetaking

What types of occupational courses did occupational investors (graduates who earned 3.0 or more occupational credits in high school) take instead of concentrating in an occupational program area? Some of the decline in the propensity of occupational investors to concentrate in occupational education was due to a shift from concentrating (earning 3.0 or more credits) in business services to taking more communications technology and computer technology courses. That is, occupational investors as a group took fewer business services courses over the period studied (specifically, fewer noncomputer-related business services courses)—enough to reduce their concentrating in this program area at a relatively high rate. At the same time, they took additional communications technology and computer technology courses—but not enough to increase their rates of concentrating on a par with their increased coursetaking in these program areas. Thus, the decline in occupational investors' propensity to concentrate in business services coincided with an increase in their total computer-related coursetaking within the occupational education curriculum.

Shifts Away From Completing an Advanced Occupational Concentration

What types of occupational courses did occupational concentrators take in high school instead of completing advanced coursework in their area of concentration? In part, occupational concentrators took fewer courses in general in their respective areas of concentration between 1982 and 1998. This decrease was due primarily to a decline in second- or higher-level coursetaking, rather than declines in first-level, cooperative education, or specialty courses. As a result of this change, occupational concentrators shifted the distribution of their occupational coursework toward specialty courses. (Typically, specialty courses either offer specialized occupational training or provide related skills that can be applied to a range of occupations and are not part of the usual sequence of courses in a program area.)

Work-Based Learning

About one-third of 1998 public high school graduates took at least some work-based learning courses—defined here as general work experience courses and cooperative education courses—in high school.[6] There were no significant differences in either the percentage of 1982 and 1998 graduates taking these courses or the average number of credits these graduates earned in work-based learning courses. Both 1982 and 1998 graduates earned on average about 0.5 credits in work-based learning courses—equivalent to one half-year course.

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[6] General work experience awards school credit for work that is *not* connected to a specific occupational program, while cooperative education awards school credit for work experience that *is* related to a student's occupational program. This analysis focuses on these types of work-based learning, because they are awarded school credit and recorded on transcripts. In addition, as of 1997, cooperative education was one of the two most common forms of work-based learning in high schools, along with job shadowing (Levesque et al. 2000).

Vocational/Technical Coursetaking and State High School Graduation Requirements

The report examined changes in participation in vocational/technical education among states that had different changes in high school graduation requirements. Because of limitations in the data, the analysis was restricted to changes between 1990 and 1998.[7] Although there were no significant differences between 1990 and 1998 in the percentage of graduates taking vocational/technical courses or in the average number of vocational/technical credits earned by graduates, coursetaking patterns varied somewhat with changes in state graduation requirements over this shortened period.

There was some evidence that, in states that increased their total graduation requirements or their total nonvocational/technical requirements, students decreased their vocational/technical coursetaking. For example, students in states that increased their total high school graduation requirements by 2.0 or more credits between 1990 and 1998 earned on average 1.0 fewer vocational/technical credits by the end of the period. Similarly, students in states that increased their total high school graduation requirements by 2.0 or more credits between 1990 and 1998 were less likely by the end of the period to invest (earn 3.0 or more credits) in vocational/technical education, to invest (earn 3.0 or more credits) in occupational education, or to concentrate (earn 3.0 or more credits) in one of the 10 broad occupational program areas in figure A. In contrast, students in states that increased their total high school graduation requirements by fewer than 2.0 credits, that did not increase these requirements, or that did not have applicable state requirements did not exhibit statistically significant decreases on any of these vocational/technical coursetaking measures.

Trends in Computer-Related Coursetaking

The SST currently includes all computer-related courses (including those taught in mathematics and computer science departments) under the vocational/technical curriculum. Although some of these courses are classified as general labor market preparation (under basic typewriting/keyboarding and technology education), most computer-related courses are classified as occupational education. These latter courses are included under the business services, computer technology, and drafting/graphics areas.

Computer-Related Coursetaking in 1998

The 1998 public high school graduates earned on average 1.05 credits in computer-related courses in high school—equivalent to about one full-year computer-related course. Most of these credits were earned in the occupational curriculum, while the rest were earned in general labor market preparation. Within the occupational curriculum, 1998 public high school graduates earned more computer-related credits on average in the business services and the computer technology program areas than in computer-related drafting/graphics courses. Within the general labor market preparation curriculum, 1998 public high school graduates earned more credits in basic typewriting/keyboarding than in technology education.

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[7] It was not possible to link student transcripts to states in the High School and Beyond data set, which provided information on 1982 high school graduates for this report, and data on state graduation requirements were not available for 1992 and 1994.

Within the computer technology program area, 1998 graduates earned more high school credits on average in computer applications courses than in any other computer technology area (including computer science and systems, computer programming, data processing, and computer mathematics).

Trends in Computer-Related Coursetaking

Due to inconsistencies over time in whether basic typewriting/keyboarding courses were classified as computer related (Alt and Bradby 1999), trends in computer-related general labor market preparation courses and in overall computer-related coursetaking were examined from 1990 to 1998. There was no significant difference in the average number of overall computer-related credits earned by 1990 and 1998 graduates or in the average number of computer-related credits they earned within the occupational curriculum. However, comparing 1998 graduates with their 1990 counterparts, there was a decline in the average number of computer-related credits these graduates earned within the general labor market preparation curriculum. This decline was due primarily to graduates taking fewer basic typewriting/keyboarding courses in high school during the 1990s.

In contrast to trends in overall computer-related coursetaking and in computer-related general labor market preparation coursetaking, trends in computer-related occupational coursetaking cover the entire period from 1982 to 1998. Graduates earned on average 0.58 more computer-related occupational credits in high school in 1998 than in 1982, equivalent to more than one additional half-year course. Specifically, 1998 public high school graduates earned on average 0.32 more computer-related credits in business services, compared with 0.20 more credits in computer technology and 0.06 more computer-related credits in drafting/graphics than their 1982 counterparts.

Academic Coursetaking Trends

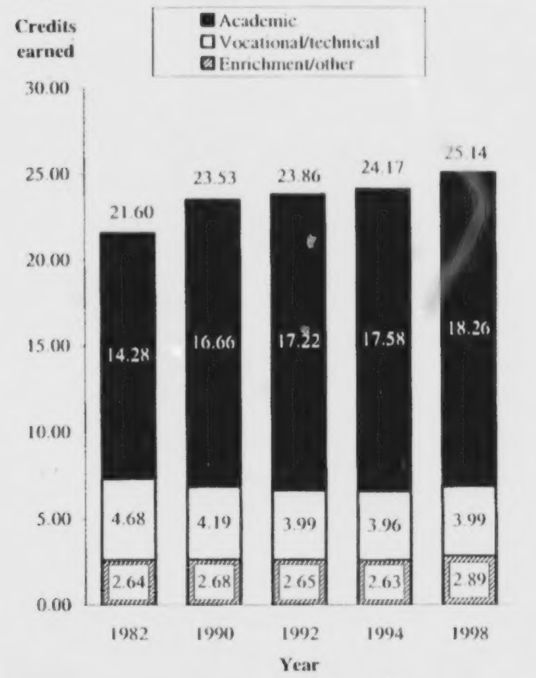
Between 1982 and 1998, public high school graduates increased both the number and rigor of the academic courses they took in high school. On average, 1998 graduates earned 3.98 more credits in academic courses—equivalent to about four full-year academic courses—and they earned more credits in each core academic subject (English, mathematics, science, and social studies) than their 1982 counterparts. The 1998 graduates were also more likely to take advanced coursework in English, mathematics, and science than the 1982 graduates.

Graduates on average decreased their vocational/technical coursetaking by a relatively small amount while taking additional academic coursework over the period studied. In general, students made room for additional academic courses primarily by increasing the total number of credits they earned in high school rather than by reducing their vocational/technical coursetaking. The 1998 public high school graduates earned 0.69 fewer vocational/technical credits on average than the 1982 graduates, while they earned 3.98 more academic credits and 0.25 more enrichment/other credits than their 1982 counterparts (figure C).

Trends in the Academic Coursetaking of Occupational Concentrators

Both occupational concentrators and nonconcentrators (the latter including all public high school graduates except occupational concentrators) increased the number and rigor of the academic courses they took between 1982 and 1998. In some instances, the rate of increase was greater

Figure C. Average number of credits earned by public high school graduates, by curriculum: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

for occupational concentrators, possibly because they took fewer and less rigorous academic courses than nonconcentrators at the beginning of the period. Nevertheless, as of 1998, occupational concentrators still took fewer and less rigorous academic courses than nonconcentrators.

For example, although the increase between 1982 and 1998 in mathematics credits earned by occupational concentrators was greater than the corresponding increase for nonconcentrators, occupational concentrators still earned fewer mathematics credits than nonconcentrators at the end of the period. In addition, although both occupational concentrators and nonconcentrators were more likely to take advanced mathematics coursework in 1998 than in 1982, nonconcentrators were more likely than concentrators to do so at the end of the period.

However, as of 1998, coursetaking differences between occupational concentrators and nonconcentrators in English, mathematics, and social studies were fairly small (with differences of less than 0.4 credits on average), and the level of coursetaking for both groups was fairly high (with more than 75 percent meeting the New Basics standards in these subjects[8]), compared with the level of science coursetaking. As of 1998, the gap between occupational concentrators and nonconcentrators in science coursetaking was significantly larger in chemistry than in biology.

Combining College-Preparatory and Occupational Coursework

In keeping with increased academic coursetaking in general, high school students became more likely to complete college-preparatory coursework over the period studied.[9] The percentage of public high school graduates completing college-preparatory coursework in high school increased from 8.7 percent for the class of 1982 to 38.9 percent for the class of 1998.

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[8] The New Basics core academic standards include 4 years of English, and 3 years each of mathematics, science, and social studies (National Commission on Excellence in Education 1983).

[9] College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the Algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

Students also became more likely to combine college-preparatory and occupational coursework over the period studied. Specifically, the percentage of public high school graduates completing both college-preparatory coursework and an occupational concentration in high school increased from 0.6 percent for the class of 1982 to 6.5 percent for the class of 1998. Similarly, the percentage of occupational concentrators who also completed college-preparatory coursework increased from 1.7 percent for 1982 graduates to 25.9 percent for 1998 graduates.

Related Academic and Occupational Coursetaking by Program Area

The report identified specific mathematics and science courses that were judged to be related to the 18 narrow occupational program areas in figure A. The report then compared the related-academic coursetaking rates for concentrators in specific occupational programs with the overall coursetaking rate for 1998 public high school graduates.

Based on this analysis, concentrators in several occupational program areas were found to have taken related academic courses at rates that were below the average rate for all 1998 public high school graduates. In particular, concentrators in construction, mechanics and repair, materials production, food service and hospitality, and personal and other services took all of the identified related academic courses at *below*-average rates. At the same time, concentrators in communications technology took some of their identified related academic courses at *above*-average rates.

However, concentrators in most program areas took related academic courses at rates that were not statistically different from the average for all graduates, including concentrators in agriculture, business services, business management, marketing, health care, computer technology, print production, and other precision production.

Foreword

In 1987, the National Center for Education Statistics (NCES) instituted a new approach to collecting and reporting data on vocational education. Under the new approach, vocational education data are collected primarily through general purpose surveys—including high school transcript studies—rather than separate vocational education questionnaires or studies. This arrangement allows NCES to situate vocational education activities within the broader education context. In 1998, a Technical Review Panel was formed to provide NCES with regular input on its Data on Vocational Education (DOVE) program, including surveys and reports.

This report updates and expands upon trends in high school vocational/technical coursetaking that were published in previous NCES reports, including the comprehensive *Vocational Education in the United States* series (Levesque et al. 1995, 2000; and Hoachlander, Kaufman, and Levesque 1992) and *Trends in Participation in Secondary Vocational Education: 1982–1992* (Tuma 1996). The current report provides a more detailed analysis of trends in high school vocational/technical coursetaking than was published previously, including trends in vocational/technical coursetaking overall, in technology education and computer-related coursetaking, and in the ways in which high school students combine vocational/technical and academic coursetaking.

Information on NCES' DOVE program and publications may be found at the following web site: *http://nces.ed.gov/surveys/dove*. Your comments about NCES vocational education publications are welcome and may be sent to Lisa Hudson, NCES, 1990 K Street NW, Suite 900, Washington, DC 20006 or *lisa.hudson@ed.gov*.

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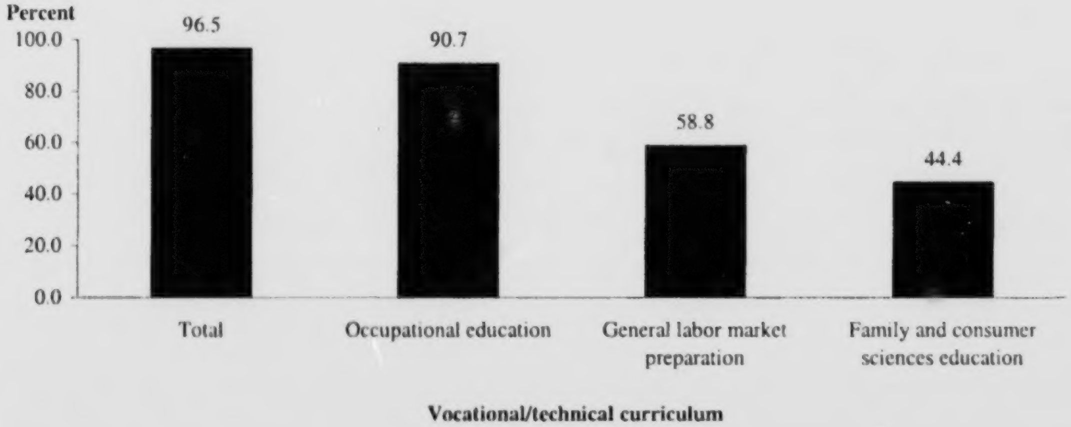
I. Introduction

Vocational/technical education is a common component of public high school education in the United States. In 1998, more than half (28) of the 50 states required some vocational/technical education for high school graduation.[1] Vocational/technical coursetaking is more extensive than these requirements would indicate, however, with most public high school graduates taking some vocational/technical education between grades 9 and 12. Among 1998 public high school graduates, 96.5 percent earned at least some credits in vocational/technical education in high school (figure 1 and table A1). In addition, 1998 graduates earned numbers of credits in vocational/technical education that were not significantly different on average from the numbers of credits they earned in English and in social studies, and they earned more credits in vocational/technical education than they did in mathematics, science, fine arts, or foreign languages (figure 2).

Figure 1. Percentage of public high school graduates taking vocational/technical education courses, by vocational/technical curriculum: 1998



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

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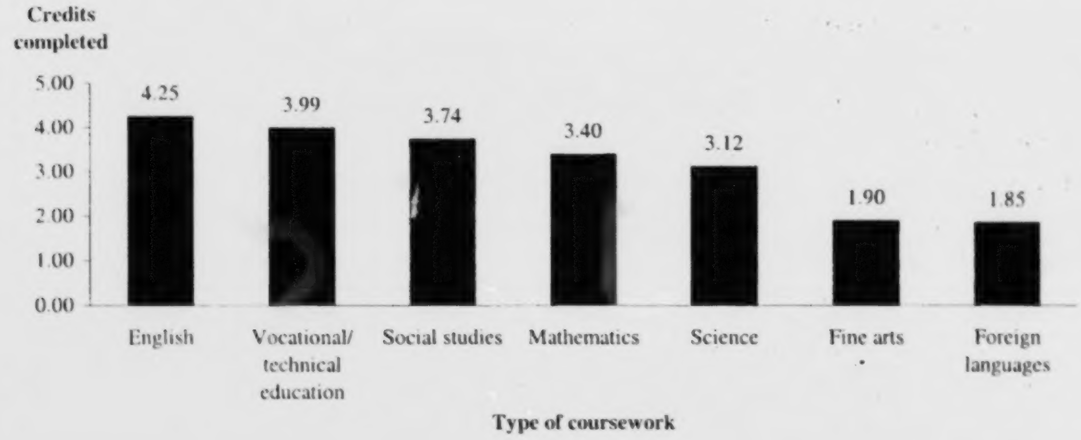
[1] These states variously required coursework in career education (including guidance), practical arts, computer education, free enterprise, technology, consumer education, and "vocational education." For the complete list of 1998 state graduation requirements, see Snyder and Hoffman (2001), table 154.

Figure 2. **Average number of credits completed by public high school graduates, by type of coursework: 1998**



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Purpose of the Report

The Carl D. Perkins Vocational and Applied Technology Act Amendments of 1998 (Perkins III) requires that the National Center for Education Statistics (NCES) collect and report information on vocational/technical education as part of its assessments. This report updates and expands upon trends in vocational/technical coursetaking that were published in the NCES report *Vocational Education in the United States: Toward the Year 2000* (Levesque et al. 2000). Specifically, this report examines vocational/technical coursetaking among public high school graduates between 1982 and 1998 by focusing on trends in three areas: in vocational/technical coursetaking overall, in technology education and computer-related coursetaking, and in the ways in which high school students combine vocational/technical and academic coursetaking. A companion report, *Public High School Graduates Who Participated in Vocational/Technical Education: 1982–1998* (Levesque forthcoming), examines trends in the participation of special and protected populations compared with other students.

The Policy and Labor Market Context: 1982–98

To set the stage for this analysis, the report first reviews education policy and labor market trends that form the background for students' vocational/technical coursetaking over the period studied.

School Reform Efforts

In 1983, *A Nation at Risk* focused attention on shortcomings in the nation's public schools (National Commission on Excellence in Education 1983). The bipartisan report linked poor economic productivity and worker skill deficits to a lack of rigor in public education. While the report made specific recommendations for high school graduation requirements, it also sounded the education alarm generally. Many state policymakers responded during the 1980s by increasing high school graduation requirements. From 1980 to 1990, 39 states increased the total number of credits they required for high school graduation,[2] although the number of states meeting the Commission's recommendations for core academic subjects[3] only rose from 1 to 3 states (tables 1a and 1b). During the 1990s, state reform efforts continued. By 1998, for example, 2 more (net) states had increased their total graduation requirements, and 10 additional states had met the core academic recommendations specified in *A Nation at Risk*.

The Carl D. Perkins Vocational and Applied Technology Act Amendments of 1990 (Perkins II) called for reforming vocational/technical education in ways that reflected national efforts to improve academic achievement. Perkins II required that states develop performance measures and standards for evaluating vocational/technical programs, including a measure of the academic achievement gains of vocational/technical participants. Perkins II also called for integrating academic and vocational/technical education and developing tech-prep programs that span the last 2 years of high school and the first 2 years of college.[4] The Perkins II reforms intended in part to improve the academics that students received *in* their occupational courses as well as the academics they took *in combination with* their occupational courses. That is, the reforms envisioned participation in vocational/technical education partly as a vehicle for improving academic achievement, separate from and combined with academic reforms.

In 1994, the School-to-Work Opportunities Act (STWOA) was passed to encourage states to better prepare all students for college *and* work. It emphasized three key practices: integrating academic and vocational/technical education, integrating school- and work-based learning, and developing secondary and postsecondary linkages. While STWOA reflected the national emphasis on academic achievement (that is, preparation for college or further education), it also provided an equal emphasis on education for work. Among its provisions, STWOA called for better

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[2] This number includes 8 states that instituted high school graduation requirements where previously there were none.

[3] The report recommended that all high school graduates take 4 years of English and 3 years each of mathematics, science, and social studies.

[4] Perkins III repeated these reform directives, while also fine-tuning them. The most recent high school transcript study that was available when this analysis was undertaken was conducted in 1998, however, so it was not possible for this report to examine trends in vocational/technical coursetaking following implementation of Perkins III.

Table 1a. Number of total credits required by each of the 50 states to graduate from high school with a standard diploma: 1980, 1990, and 1998

	Year			Change		
	1980	1990	1998	1980 to 1990	1990 to 1998	1980 to 1998
Alabama	20	22	24	2	2	4
Alaska	19	21	21	2	0	2
Arizona	16	20	20	4	0	4
Arkansas	16	20	21	4	1	5
California	—	13	13	†	0	†
Colorado	—	—	—	†	†	†
Connecticut	—	20	20	†	0	†
Delaware	18	19	19	1	0	1
Florida	—	24	24	†	0	†
Georgia	20	21	21	1	0	1
Hawaii	20	20	22	0	2	2
Idaho	18	21	21	3	0	3
Illinois	16	16	16	0	0	0
Indiana	16	20	20	4	0	4
Iowa	—	—	—	†	†	†
Kansas	17	21	21	4	0	4
Kentucky	18	20	22	2	2	4
Louisiana	20	23	23	3	0	3
Maine	—	16	16	†	0	†
Maryland	20	20	21	0	1	1
Massachusetts	—	—	—	†	†	†
Michigan	—	—	—	†	†	†
Minnesota	15	20	—	5	†	†
Mississippi	16	18	20	2	2	4
Missouri	20	22	22	2	0	2
Montana	16	20	20	4	0	4
Nebraska	—	—	—	†	†	†
Nevada	19	23	23	4	0	4
New Hampshire	16	20	20	4	0	4
New Jersey	—	22	22	†	1	†
New Mexico	20	23	23	3	0	3
New York	16	19	21	3	2	5
North Carolina	16	20	20	4	0	4
Northa Dakota	17	17	17	0	0	0
Ohio	17	18	18	1	0	1
Oklahoma	18	20	21	2	1	3
Oregon	21	22	22	1	0	1
Pennsylvania	13	21	21	8	0	8
Rhode Island	16	16	16	0	0	0
South Carolina	18	20	20	2	0	2
South Dakota	16	20	20	4	0	4
Tennessee	18	20	20	2	0	2
Texas	18	21	22	3	1	4
Utah	15	24	24	9	0	9
Vermont	—	16	15	†	-1	†
Virginia	18	21	22	3	1	4
Washington	—	19	19	†	0	†
West Virginia	18	21	21	3	0	3
Wisconsin	—	13	22	†	9	†
Wyoming	18	18	13	0	-5	-5

—Indicates that local school boards set high school graduation requirements.

†Not applicable.

SOURCE: Education Commission of the States (1990); Snyder and Hoffman (1992), table 145, and Snyder and Hoffman (2001), table 154.

Table 1b. Number of the 50 states meeting or exceeding the New Basics core academic requirements,[1] by whether states met or exceeded the New Basics core academic requirements in each year: 1980, 1990, and 1998

	1980	1990	1998
Total	1	3	13
Alabama			✓
Alaska			
Arizona	—	—	—
Arkansas			✓
California	—		
Colorado	—	—	—
Connecticut	—		
Delaware			
Florida	—	✓	
Georgia			✓
Hawaii	✓		✓
Idaho			
Illinois			
Indiana			
Iowa	—	—	—
Kansas			
Kentucky			✓
Louisiana		✓	✓
Maine	—		
Maryland			✓
Massachusetts	—	—	—
Michigan	—	—	—
Minnesota			—
Mississippi			✓
Missouri			
Montana			
Nebraska	—	—	—
Nevada			
New Hampshire			
New Jersey	—		
New Mexico			
New York			
North Carolina			✓
Northa Dakota			
Ohio			
Oklahoma			
Oregon			
Pennsylvania		✓	✓
Rhode Island			
South Carolina			
South Dakota			
Tennessee			✓
Texas			
Utah			
Vermont	—		
Virginia			✓
Washington	—		
West Virginia			
Wisconsin	—		
Wyoming			✓

—Indicates that local school boards set high school graduation requirements.

✓State graduation requirements met or exceeded the New Basics core academic requirements.

[1] The New Basics core academic requirements include 4 years of English and 3 years each of mathematics, science, and social studies.

SOURCE: Education Commission of the States (1990); Snyder and Hoffman (1992), table 145, and Snyder and Hoffman (2001), table 154.

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career preparation, through career guidance and work experience activities, and the development of high school programs of study called "career majors" or "career pathways."

The focus on academic achievement during the 1980s and 1990s may have influenced vocational/technical coursetaking over this period in a number of different ways. After taking more academic courses, students may have had less time to devote to other coursework, including vocational/technical education. However, attention to the academic achievement of participants in vocational/technical education may have made vocational/technical education an alternative path for learning academics during the 1990s. In addition, emphasis on preparing all students for both college and work may have bolstered vocational/technical coursetaking in recent years. Although this report does not seek to evaluate the impact of particular federal policies, these policies set the context in which the trends examined in this report occurred.

Labor Market Trends

Long-term trends in labor market demand for higher skills may also have influenced vocational/technical coursetaking over the period studied (Levesque et al. 2000). On the one hand, increased demand for academic skills and higher levels of education may have reduced vocational/technical coursetaking. Some graduates who may previously have terminated their education with high school or a postsecondary certificate or associate's degree may now pursue a bachelor's or higher degree.[5] Thus, students may take fewer vocational/technical courses in high school as they shift their educational plans and aspirations toward 4-year or higher degrees.

On the other hand, demand for greater technical skills and degrees—particularly resulting from the technology boom of the 1990s—may have increased vocational/technical coursetaking. These increases may have occurred for all students because all workers may arguably need technology-related skills regardless of when they enter the labor market. Alternatively, increases in technology-related coursework in high school may be greater for students planning to enter the labor market directly after high school or after completing 1- or 2-year postsecondary programs because these students have less time in which to acquire technology-related skills before obtaining employment.

Changes in the demand for specific types of jobs may also lead to occupational coursetaking changes, and these changes may not reflect overall vocational/technical coursetaking patterns. For example, labor market shifts away from manufacturing toward services and information industries have been accompanied, to some extent, by corresponding changes in coursetaking in related vocational/technical program areas (Levesque et al. 2000; Hurst and Hudson 2000).

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[5] The trend toward higher educational attainment among the U.S. population is well documented. See, for example, Levesque et al. (2000), pp. 149–151. Vocational/technical education is defined at the federal level as preparing students for careers requiring less than a bachelor's degree.

Research Questions

It is not possible in this analysis to determine the causal impact of education policies and labor market trends on vocational/technical coursetaking. However, based on the policy and labor market trends discussed above, this report seeks to address the following research questions:

1. What have been the trends in vocational/technical coursetaking between 1982 and 1998? Are changes evident across the board or focused in particular areas of the vocational/technical curriculum?
2. Has the nature of vocational/technical coursetaking changed, and, if so, how? What types—and what mix—of vocational/technical courses were students taking as of 1998?
3. What vocational/technical areas exhibit increases in coursetaking? In particular, has coursetaking in technology education and computer-related areas risen? What vocational/technical areas exhibit decreases in coursetaking?
4. How have students combined academic and vocational/technical coursetaking over the period studied? To what extent have the rates of academic coursetaking among participants in vocational/technical education risen between 1982 and 1998, and how does this increase compare with the rates of academic coursetaking among other students? To what extent do students take academic coursework that is related to their occupational coursework?

Description of the Data

This report analyzes trends in vocational/technical and academic coursetaking by examining high school transcripts for the graduating classes of 1982, 1990, 1992, 1994, and 1998.[6] The analysis focuses on public high school graduates who earned regular or honors diplomas.[7] A detailed description of the data surveys and the rules for including students in the analysis population are provided in appendix D. Trends are limited to the years studied; that is, although the data may indicate a decline from 1982 to 1992 after which no significant changes were detected, the low point may have been reached in 1991 or 1993, or there may have been unobservable spikes (highs or lows) in unexamined years. It is assumed in this report, however, that if a consistent trend appears in the data, then a trend existed throughout the period highlighted by the survey years.

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[6] These transcript studies were conducted as part of the High School and Beyond (HS&B) Sophomore Cohort Study (1982 graduates), the National Education Longitudinal Study of 1988 (NELS, 1992 graduates), and the High School Transcript Studies (HSTS) of 1990, 1994, and 1998 (1990, 1994, and 1998 graduates, respectively).

[7] The HS&B and NELS studies excluded students with the most-severe disabilities, where it was determined by school staff that these students were unable to complete the lengthy student questionnaires that were a part of these studies. In order to ensure comparability across the data sets, graduates with special education diplomas were excluded from the HSTS samples (Gifford et al. 1989; Tuma 1996). Thus, the samples used for this trend analysis were consistent with the population of public high graduates, including students with disabilities, who earned regular or honors diplomas in each of the study years. This restriction is consistent with NCES reports on high school vocational/technical coursetaking published over the last decade and is consistent with NCES procedures for transcript studies (Alt and Bradby 1999). In addition, there are some minor coding differences between NELS and the other transcript data that may affect the data for 1992. See appendix D for more information.

Transcripts provide information on the courses that public high school graduates took in grades 9 through 12. For simplicity's sake, the report refers to this information as "high school coursetaking." With the exception of the section on vocational/technical coursetaking by grade level, which examines coursetaking in each grade 9 through 12 separately, the report describes the cumulative coursework that graduates took in high school.

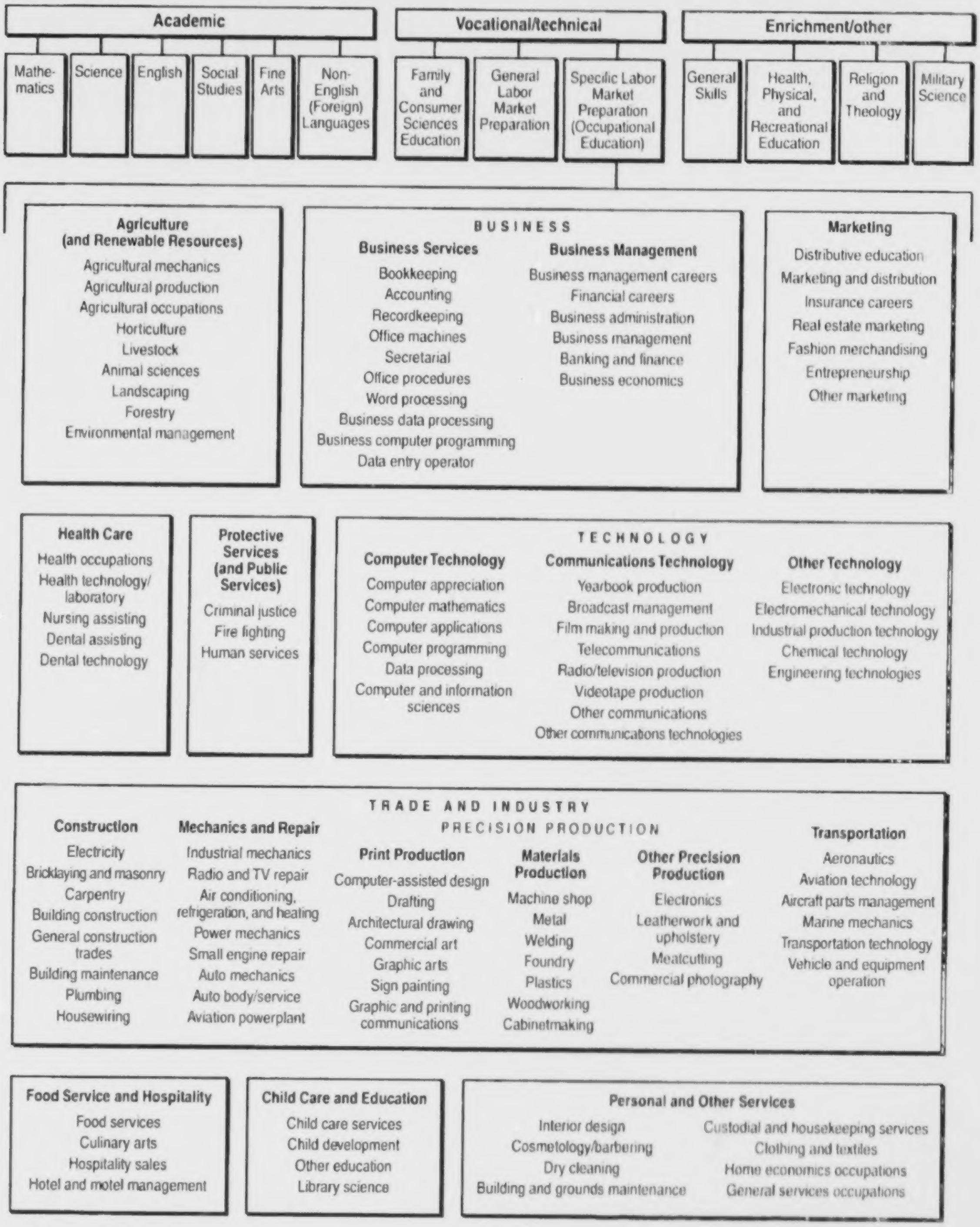
Researchers assigned codes to each course on a transcript according to the Classification of Secondary School Courses (CSSC) (Westat 1992). The analysis for this report then used the Secondary School Taxonomy (SST) to classify these codes into broader course groupings (Bradby and Hoachlander 1999). As figure 3 shows, the SST classifies high school courses into three main areas (academic, vocational/technical, and enrichment/other) and their curricular subareas. The same course classification was applied to each of the five data surveys used in the analysis so that coursetaking was defined consistently over time.

In addition to the name of a course, the transcripts also provide the number of credits a student earned for each course. Credits have been standardized across the survey years, so that 1.0 credit is equivalent to completing a course that meets one period per day for an entire school year. This is equivalent to a standard Carnegie unit. However, for simplicity's sake, the report refers to credits rather than Carnegie units.

Some Limitations of Transcript Studies

Transcript studies provide a reliable source of information on student coursetaking. These studies do have some limitations, however. First, transcript studies can describe the intended—but not the actual—curriculum. That is, researchers classify the courses listed on transcripts based on course catalogs provided by participating schools. Teachers may or may not adhere strictly to the official catalog description when teaching a course. Often, different teachers in a school will cover different materials on any given day—and even over an entire semester or school year—and may use different instructional practices. When examining courses with similar names and descriptions from schools across the nation, researchers are likely to find an even wider variation in content than is present in a single school. Thus, they cannot determine from transcript studies the actual content students were exposed to when they took a particular course.

Figure 3. Secondary school taxonomy


Academic
Mathematics
Science
English
Social Studies
Fine Arts
Non-English (Foreign) Languages
Vocational/technical
Family and Consumer Sciences Education
General Labor Market Preparation
Specific Labor Market Preparation (Occupational Education)
Enrichment/other
General Skills
Health, Physical, and Recreational Education
Religion and Theology
Military Science
Agriculture (and Renewable Resources)
Agricultural mechanics
Agricultural production
Agricultural occupations
Horticulture
Livestock
Animal sciences
Landscaping
Forestry
Environmental management
BUSINESS
Business Services
Bookkeeping
Accounting
Recordkeeping
Office machines
Secretarial
Office procedures
Word processing
Business data processing
Business computer programming
Data entry operator
Business Management
Business management careers
Financial careers
Business administration
Business management
Banking and finance
Business economics
Marketing
Distributive education
Marketing and distribution
Insurance careers
Real estate marketing
Fashion merchandising
Entrepreneurship
Other marketing
Health Care
Health occupations
Health technology/laboratory
Nursing assisting
Dental assisting
Dental technology
Protective Services (and Public Services)
Criminal justice
Fire fighting
Human services
TECHNOLOGY
Computer Technology
Computer appreciation
Computer mathematics
Computer applications
Computer programming
Data processing
Computer and information sciences
Communications Technology
Yearbook production
Broadcast management
Film making and production
Telecommunications
Radio/television production
Videotape production
Other communications
Other communications technologies
Other Technology
Electronic technology
Electromechanical technology
Industrial production technology
Chemical technology
Engineering technologies
TRADE AND INDUSTRY
Construction
Electricity
Bricklaying and masonry
Carpentry
Building construction
General construction trades
Building maintenance
Plumbing
Housewiring
Mechanics and Repair
Industrial mechanics
Radio and TV repair
Air conditioning, refrigeration, and heating
Power mechanics
Small engine repair
Auto mechanics
Auto body/service
Aviation powerplant
PRECISION PRODUCTION
Print Production
Computer-assisted design
Drafting
Architectural drawing
Commercial art
Graphic arts
Sign painting
Graphic and printing communications
Materials Production
Machine shop
Metal
Welding
Foundry
Plastics
Woodworking
Cabinetmaking
Other Precision Production
Electronics
Leatherwork and upholstery
Meatcutting
Commercial photography
Transportation
Aeronautics
Aviation technology
Aircraft parts management
Marine mechanics
Transportation technology
Vehicle and equipment operation
Food Service and Hospitality
Food services
Culinary arts
Hospitality sales
Hotel and motel management
Child Care and Education
Child care services
Child development
Other education
Library science
Personal and Other Services
Interior design
Cosmetology/barbering
Dry cleaning
Building and grounds maintenance
Custodial and housekeeping services
Clothing and textiles
Home economics occupations
General services occupations

SOURCE: Adapted from Bradby, D. and Hoachlander, E.G. (1999). *1998 Revision of the Secondary School Taxonomy* (NCES 1999-06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

Second, the CSSC and the SST rarely make it possible to identify courses taught using particular instructional methodologies. To classify the courses listed on transcripts, researchers may consider both content and instructional methodology and then assign an appropriate CSSC code to a course. For example, they may assign one CSSC code to courses teaching general mathematics, while they may assign a different code to courses teaching general mathematics through applied methods. However, it is not always possible to determine the instructional methodology used from a course title or even from a course description. Therefore, not all CSSC codes distinguish among instructional methodologies. The SST organizes these CSSC codes into broader course groupings, and the 1998 revision of the SST focused on content rather than pedagogy in assigning courses. For example, both general mathematics and applied general mathematics courses are included under the General Mathematics content area of the SST. Although experts considered adding flags to course codes to indicate instructional methodology, they decided not to do so because of the limitations mentioned here (see Bradby and Hoachlander 1999, pp. 50–51).

A final limitation of transcript studies is that they cannot provide reliable information about what students have learned from a course. Rather, they can only indicate the content that students may have been exposed to by taking a particular course. For example, although a student may have earned 1.0 credit in algebra 1, it is not possible to infer the level of algebra competency a student achieved through this coursework. Even examining grades in combination with course-taking does not produce reliable information about student achievement. Although one might assume that students earning A's in algebra 1 courses achieved a higher level of competency than students earning C's in these courses, it is impossible to infer a particular level of competency because of inconsistency in grading practices and course content. Generally, one must use standardized achievement test results to describe the actual achievement levels of students in the areas tested.

Despite these limitations, transcript studies are a useful tool for examining trends in the types and combinations of courses that students take over time. To do so, researchers using transcripts make a couple of assumptions. First, they assume that variation in content occurs less within courses with the same course code or classification than it does across courses with different codes or classifications. Second, they assume that the variation within courses with the same course code or classification remains relatively constant over time. By making such assumptions, they can infer whether students are taking different types of courses or more or less rigorous coursework in a subject area or are combining coursework in different ways over time.

Terms Used in the Report

Many terms used in the report are defined in appendix C, which provides a quick reference.

The Vocational/Technical Curriculum

High school vocational/technical education encompasses three different subcurricula: specific labor market preparation or "occupational education,"[8] general labor market preparation, and family and consumer sciences education (figure 3). Occupational education consists of courses that teach skills and knowledge required in a particular occupation or set of related occupations. For example, health care programs may prepare students specifically for dental assisting or nursing assisting, or more broadly for general health occupations. Although traditionally the main purpose of occupational education was to prepare students for entering specific occupations, occupational education may also prepare students for entering a related vocational/technical program in college. Based on SST classifications, occupational education in this report consists of the 10 broad and 18 narrow program areas shown in figure 3.

Occupational courses within a program area are divided into four categories: first-level, second- or higher-level, cooperative education, and specialty courses. The first three categories generally represent sequential coursetaking. For example, in some high schools, a planned occupational program of study may include health occupations 1 in the 10th grade, health occupations 2 in the 11th grade, and health occupations cooperative education in the 12th grade. In other high schools, health occupations cooperative education may follow health occupations 1, either with or without concurrent enrollment in health occupations 2. Other high schools may offer 2 years of health occupations cooperative education courses following a first and/or second course. In addition to these generally sequential courses, some high schools offer specialty courses in a program area. In some cases, specialty courses offer more specialized occupational training (such as home health aide), while in others they provide related skills that can be applied to a range of occupations (such as medical terminology). Students may take specialty courses to satisfy a particular interest in a topic or to obtain skills that are broadly applicable to a career field or for other reasons. For purposes of this analysis, second- or higher-level and cooperative education courses were considered to represent *advanced* coursework in a program area.

General labor market preparation consists of courses that teach general employment skills that are not specific to one occupational area, such as basic typewriting/keyboarding, introductory technology education, and career preparation and general work experience courses. Family and consumer sciences education consists of courses intended to prepare students for family and consumer roles outside the paid labor market.[9]

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[8] For simplicity's sake, this report uses the term "occupational education" in place of "specific labor market preparation."

As of 1998, 90.7 percent of public high school graduates earned credits in occupational education in high school, 58.8 percent in general labor market preparation, and 44.4 percent in family and consumer sciences education (figure 1 and table A1).

Key Measures of Participation

Although vocational/technical coursetaking is prevalent in high schools, students take varying amounts and types of these courses and take them for different purposes. Some students seek only to meet the minimum high school graduation requirements. Others take typewriting or keyboarding to help them complete homework assignments in either high school or college or to obtain a general employability skill. Some take consumer education courses with an eye toward future homemaking. Others take computer education courses to prepare generally for the labor market. Some take a sequence of related occupational courses to prepare for work in a specific occupation and/or entry into a related vocational/technical program in college, while others take occupational courses from one or more program areas to help identify a possible college major or future career. Still others "shop around" in high school, sampling courses from both the vocational/technical and academic curricula with no clear goals in mind (Powell, Cohen, and Farrar 1985).

Because of the many ways that students participate in the vocational/technical curriculum, it is important to examine a range of measures when analyzing participation trends. Figure 4 and table A2 show the main measures that are used in this report. Because policymakers are most concerned about participation in vocational/technical education overall, and in occupational education in particular, the listed measures provide several lenses for examining these two curricula. According to the least restrictive measure—the percentage of public high school graduates who were vocational/technical coursetakers—almost all 1998 graduates (96.5 percent) participated in the vocational/technical curriculum. According to the most restrictive measure—the percentage of graduates who were occupational concentrators with cooperative education—just 4.5 percent of 1998 graduates were counted as participating in vocational/technical education. The measures are defined in ascending order of restrictiveness below, and there is considerable overlap among the measures.

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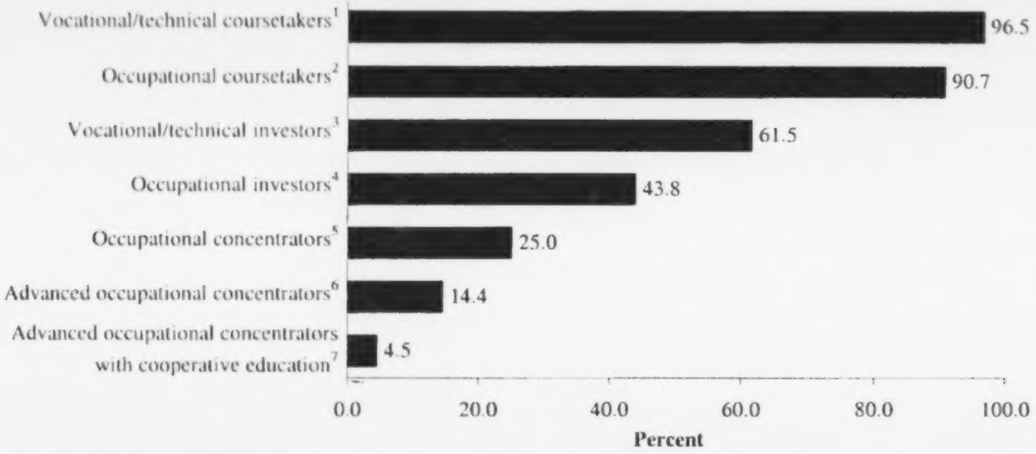
[9] Home economics-related courses that prepare students for the paid labor market are included under occupational education, in the child care and education, food service and hospitality, and personal and other services program areas.

Figure 4. Percentage of public high school graduates meeting different measures of participation in vocational/technical education: 1998



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[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Vocational/technical coursetakers—Graduates earning greater than 0.0 credits in vocational/technical education in high school. All of the following groups of students are subsets of this group.

Occupational coursetakers—Graduates earning greater than 0.0 credits in occupational education in high school. This group is a subset of the previous group.

Vocational/technical investors[10]—Graduates earning 3.0 or more credits in vocational/technical education in high school. All of the following groups of students are subsets of this group.

Occupational investors—Graduates earning 3.0 or more credits in occupational education in high school, regardless of whether they concentrate their occupational coursetaking in a single program area. This measure is a subset of the previous measure.

Occupational concentrators—Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3.[11] This measure is a subset of the previous measure. In some cases, the report also provides information on graduates concentrating (earning 3.0 or more credits) in one of the 18 narrow occupational program areas in figure 3.[12]

Advanced occupational concentrators—Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses, as described above. This measure is a subset of the previous measure. For simplicity's sake, this group is sometimes referred to in the report as "advanced concentrators."

Advanced occupational concentrators with cooperative education—Graduates earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 cooperative education credit in that program area.[13] This measure is a subset of the previous measure. For simplicity's sake, this group is sometimes referred to in the report as "concentrators with cooperative education."

In addition to tracking the percentages of public high school graduates satisfying the participation measures mentioned above, the report also examines trends in the average number of credits earned by public high school graduates in vocational/technical areas.

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[10] The terms "investor" and "concentrator" refer to specific patterns of coursetaking rather than to students' intentions.

[11] This classification was also used in Levesque et al. (2000), in which students were referred to as "vocational concentrators."

[12] Students concentrating in one of the 18 narrow occupational program areas in figure 3 represent a majority of all occupational concentrators. However, in some cases, graduates earned 3.0 or more credits in "mixed" business, technology, precision production, and trade and industry areas without earning 3.0 or more credits in one of the narrow programs within these broad areas. Where applicable, information on these "mixed" concentrators is provided.

[13] Cooperative education awards school credit for work experience that is related to a student's occupational program and typically alternates work placements and classroom time.

Although all of the above measures are discussed in this report, the report emphasizes the coursetaking patterns of occupational concentrators because this group is a common focus of federal and state accountability and research efforts for vocational/technical education (Office of Vocational and Adult Education 2002; Silverberg et al. 2002).[14]

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[14] The Office of Vocational and Adult Education (2002) and Silverberg (2002) refer to this group as "vocational" concentrators.

II. Trends in Vocational/Technical Coursetaking

This chapter examines trends in vocational/technical coursetaking in high school overall, as well as trends in vocational/technical coursetaking by grade level, occupational coursetaking by program area, concentrating in occupational education, and work-based learning. It also explores the relationship between changes in vocational/technical coursetaking and state high school graduation requirements.

Trends in Vocational/Technical Coursetaking

Overall Trends in Vocational/Technical Coursetaking

Over the period studied, the primary change in vocational/technical coursetaking was not in the proportion of high school students participating in vocational/technical education but in the amount of vocational/technical education they took. That is, the breadth of vocational/technical coursetaking declined slightly, while the depth of this coursetaking declined more steeply. However, most declines in vocational/technical coursetaking occurred by the early 1990s.

Between 1982 and 1998, almost all public high school graduates (between 98.2 percent and 96.5 percent) earned at least some credits in vocational/technical education in high school (figure 5 and table A2).[15] However, the average number of credits that public high school graduates earned in vocational/technical education decreased from 4.68 credits for the class of 1982 to 4.19 credits for the class of 1990, after which no significant changes were detected (figure 6). Similarly, the percentage of graduates earning 3.0 or more credits in vocational/technical education in high school (defined as "vocational/technical investors" in chapter I) declined from 71.3 percent for 1982 graduates to 63.7 percent for 1990 graduates (figure 5 and table A2). As of 1998, 61.5 percent of graduates invested 3.0 or more credits in vocational/technical education in high school.[16]

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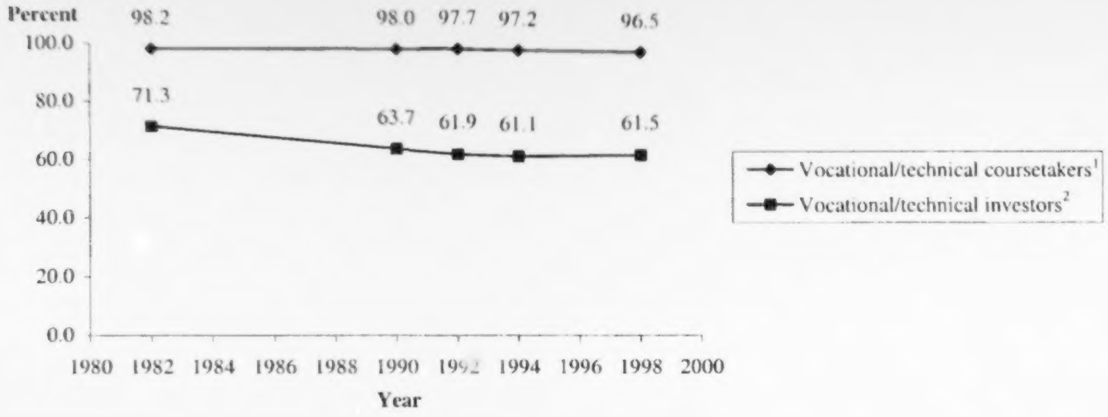
[15] The slight decrease from 98.2 percent for 1982 graduates to 96.5 percent for 1998 graduates was statistically significant.

[16] The difference in rates of investing in vocational/technical education for 1990 and 1998 graduates was not statistically significant.

Figure 5. Percentage of public high school graduates who were vocational/technical coursetakers and investors: Various years, 1982–98



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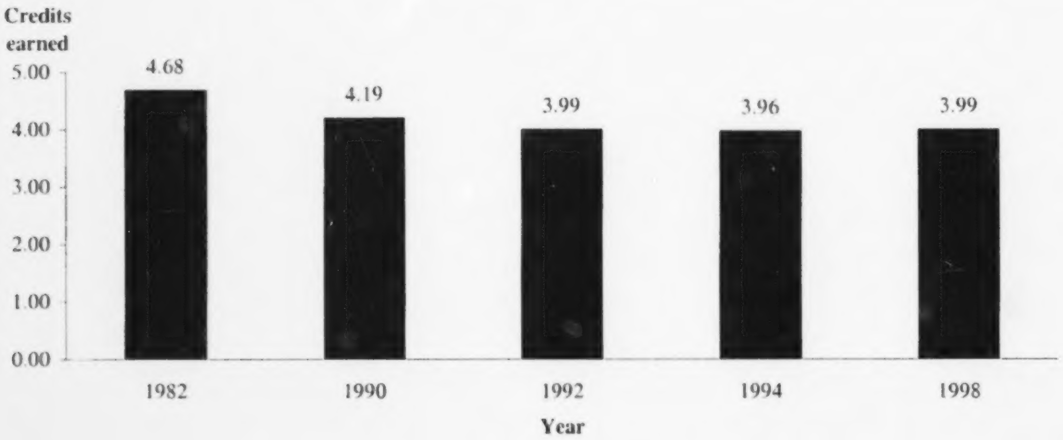
[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning 3.0 or more credits in vocational/technical education.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 6. Average number of credits earned in vocational/technical education by public high school graduates: Various years, 1982–98

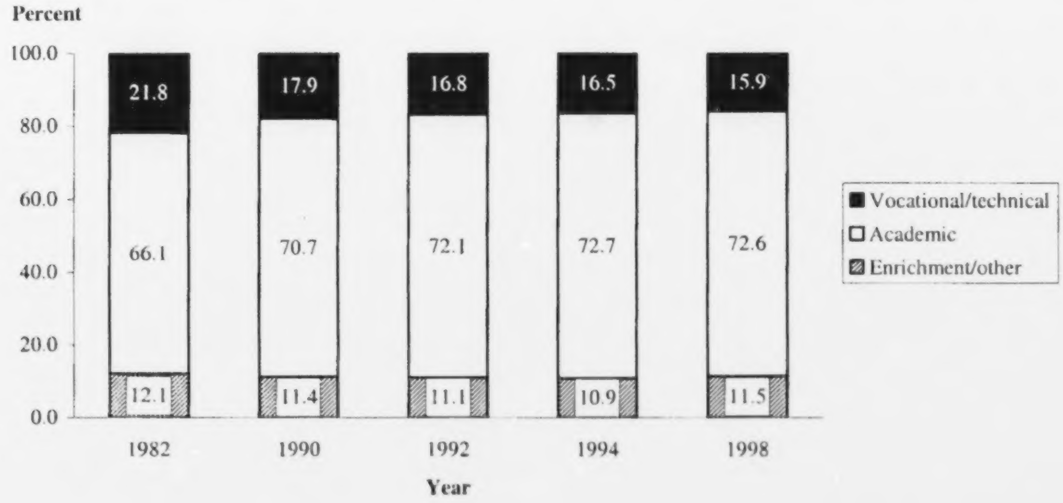


NOTE: Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Although most of the decline in average number of vocational/technical credits earned by graduates occurred by 1990, vocational/technical credits represented a declining share of the total high school credits that graduates earned throughout the 1980s and 1990s. Specifically, the share of total credits earned in high school by graduates that were vocational/technical credits decreased from 21.8 percent for 1982 graduates to 17.9 percent for 1990 graduates and then decreased further to 15.9 percent for 1998 graduates (figure 7). These relative declines were due to public high school graduates earning on average more academic credits and, to a lesser extent, more enrichment/other credits in high school over the period studied. Specifically, the number of academic credits earned on average by public high school graduates increased from 14.28 credits for 1982 graduates to 17.22 credits for 1992 graduates, and then to 18.26 credits for 1998 graduates (figure 8).[17] Between 1982 and 1998, the average number of credits that graduates earned in enrichment/other courses increased from 2.64 credits to 2.89 credits.[18]

Figure 7. Percentage distribution of total credits earned by public high school graduates, by curriculum: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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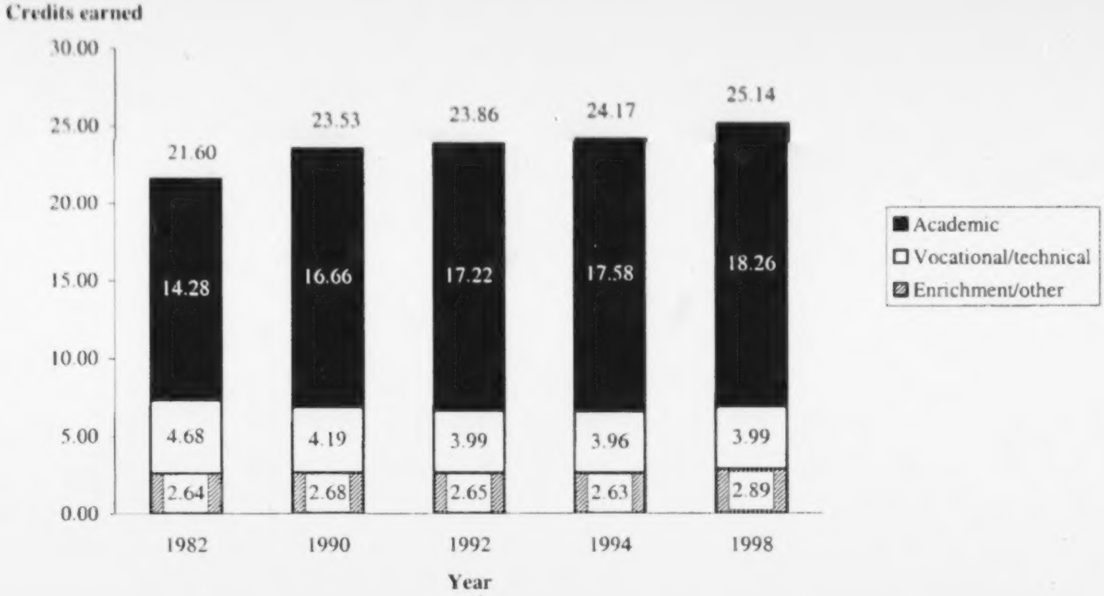
[17] The apparent increase between 1992 and 1994 was not statistically significant, although all other increases over this period were statistically significant.

[18] The change in enrichment/other credits earned was smaller than the changes in credits earned in academic and vocational/technical courses.

Figure 8. Average number of credits earned by public high school graduates, by curriculum: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

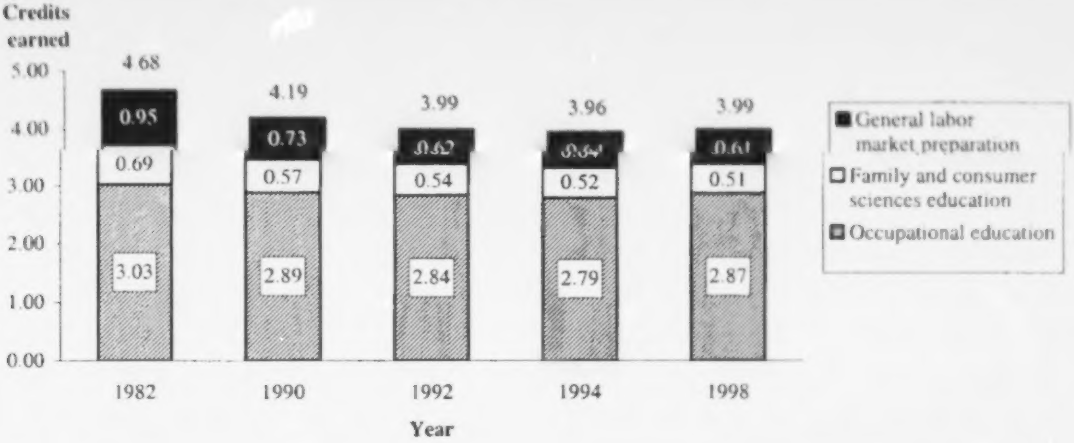
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Trends in the Three Vocational/Technical Subcurricula

As explained in chapter I, vocational/technical education consists of occupational education, general labor market preparation, and family and consumer sciences education. Relative changes in coursetaking in these three subcurricula signal changes in the nature of vocational/technical coursetaking in high school.

The decrease in vocational/technical credits earned over the period studied was due primarily to a decrease in general labor market preparation coursetaking in high school. Comparing the classes of 1982 and 1998, the number of general labor market preparation credits earned by public high school graduates declined by 0.34 credits on average (figure 9). In contrast, over this period, the number of credits that graduates earned in family and consumer sciences education declined by 0.18 credits on average, while there was no statistically significant change in the

Figure 9. Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

average number of credits that graduates earned in occupational education.[19] Paralleling declines in vocational/technical coursetaking overall, declines in general labor market preparation coursetaking occurred primarily by the early 1990s. The average number of credits that public high school graduates earned in general labor market preparation decreased from 0.95 credits for the class of 1982 to 0.62 credits for the class of 1992, after which no significant changes were detected.

The decrease in general labor market preparation credits earned was due primarily to a decrease in the number of basic typewriting/keyboarding courses that graduates took in high school (figure 10 and table A3). Comparing the classes of 1982 and 1998, the number of credits that public high school graduates earned in basic typewriting/keyboarding declined by 0.26 credits on average, about three-quarters of the total general labor market preparation decline of 0.34 credits.

As with vocational/technical coursetaking overall, the *breadth* of occupational coursetaking was fairly high over the period studied. Most public high school graduates (between 88.7 percent

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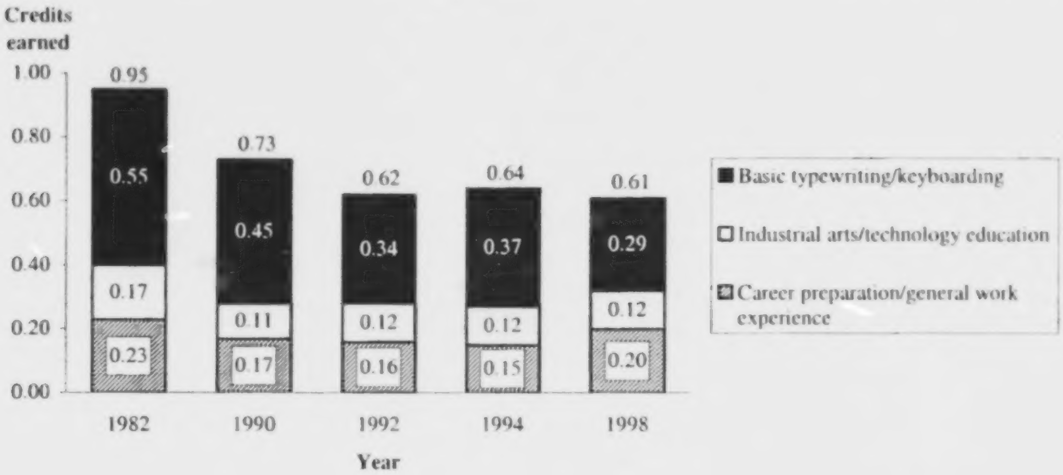
[19] Although the average number of credits that graduates earned in occupational education appeared to decline by 0.16 credits between 1982 and 1998, this apparent decline was not statistically significant.

Figure 10. Average number of credits earned in general labor market preparation by public high school graduates, by area: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

and 92.2 percent) earned at least some occupational credits in high school during this period (figure 11 and table A2).[20] However, compared with vocational/technical coursetaking, the *amount* of occupational education that graduates took remained relatively steady between 1982 and 1998. The average number of occupational credits that 1998 public high school graduates earned in high school (2.87 credits) was not statistically different from the average number earned by 1982 graduates (3.03 credits) (figure 9). Similarly, the percentage of 1982 public high school graduates who earned 3.0 or more credits in occupational education in high school (defined as "occupational investors" in chapter I) was not statistically different from the percentage for 1998 graduates (46.2 percent and 43.8 percent, respectively) (figure 11 and table A2).[21]

With declines in general labor market preparation and family and consumer sciences education coursetaking—and relatively steady patterns of occupational coursetaking—occupational

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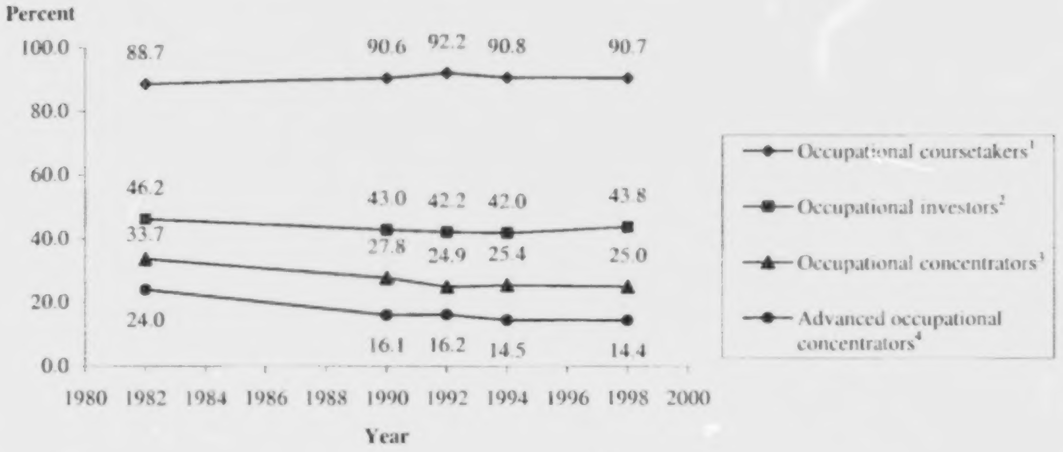
[20] The percentage of graduates earning at least some occupational credits in high school (occupational coursetakers) actually increased slightly from 88.7 percent in 1982 to 92.2 percent in 1992, after which no significant changes were detected. However, the apparent difference between the classes of 1982 and 1998 was not statistically significant.

[21] The percentage of graduates earning 3.0 or more occupational credits in high school (occupational investors) actually declined slightly from 46.2 percent in 1982 to 42.2 percent in 1992, after which no significant changes were detected. However, the apparent difference between the classes of 1982 and 1998 was not statistically significant.

Figure 11. **Percentage of public high school graduates participating in occupational education, by different definitions of participation: Various years, 1982–98**



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[1] Graduates earning greater than 0.0 credits in occupational education.

[2] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

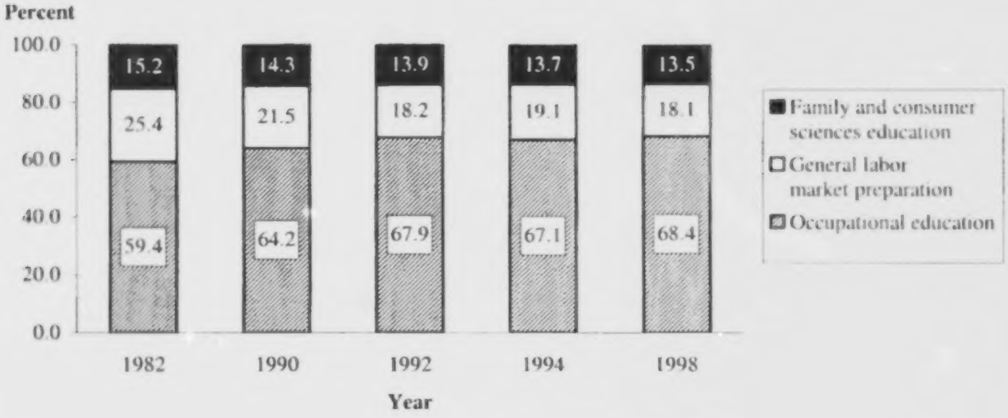
[3] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[4] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

education became a more prominent part of high school vocational/technical coursetaking over the period studied. The share of vocational/technical credits earned by public high school graduates that were occupational credits increased from 59.4 percent for 1982 graduates to 68.4 percent (about two-thirds of all vocational/technical coursetaking) for 1998 graduates (figure 12). In comparison, the share of vocational/technical credits earned by graduates that were general labor market preparation credits decreased from 25.4 percent for the class of 1982 to 18.1 percent for the class of 1998. The share of vocational/technical credits earned by 1982 graduates that were family and consumer sciences education credits was not statistically different from the share of these credits earned by 1998 graduates (15.2 percent and 13.5 percent, respectively). The 1998 public high school graduates earned about 2.87 credits in occupational education in high school, in contrast with about 0.61 credits in general labor market preparation and 0.51 credits in family and consumer sciences education (figure 9).

Figure 12. Percentage distribution of vocational/technical credits earned by public high school graduates, by vocational/technical curriculum: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

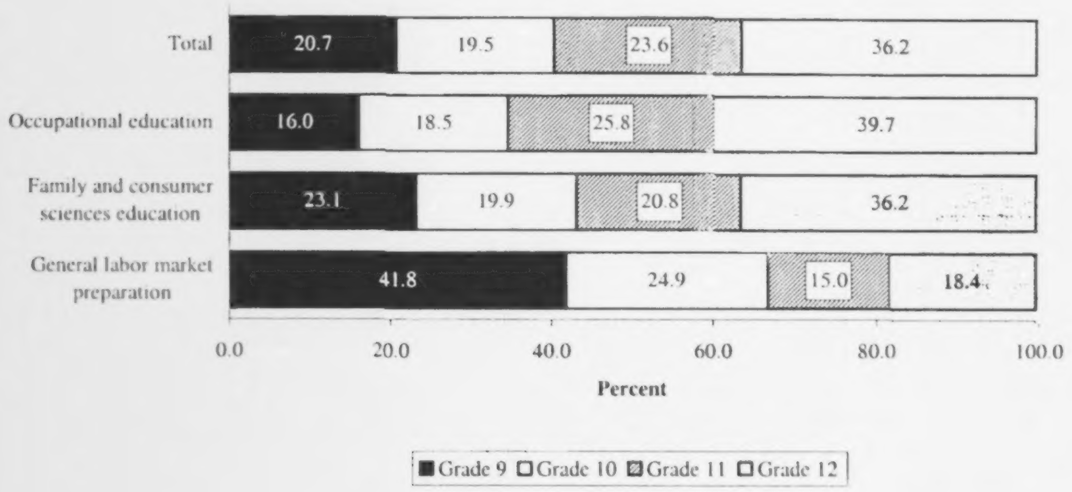
Trends in Vocational/Technical Coursetaking by Grade Level

The Timing of Vocational/Technical Coursetaking

For the high school graduating class of 1998, about 60 percent of vocational/technical coursetaking occurred in the 11th and 12th grades, while about 40 percent occurred in grades 9 and 10 (figure 13 and table A4). Specifically, more than one-third (36.2 percent) of the vocational/technical credits earned by 1998 public high school graduates were earned in grade 12. In comparison, graduates earned 23.6 percent of their vocational/technical credits in grade 11, 19.5 percent in grade 10, and 20.7 percent in grade 9. These proportions translate into 1998 public high school graduates earning 1.51 credits on average—the equivalent of about one and a half full-year vocational/technical courses—in the 12th grade. In contrast, graduates earned 1.01 credits in the 11th grade, 0.75 credits in the 10th grade, and 0.71 credits in the 9th grade (table 2).

For the graduating class of 1998, the timing of occupational and family and consumer sciences education coursetaking was similar to that of overall vocational/technical coursetaking, with more of this coursetaking occurring in grade 12 than in earlier grades. In contrast, general labor market preparation coursetaking was more likely to occur in grade 9. The 1998 public high

Figure 13. Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: 1998



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table 2. Average number of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	4.68	4.19	3.99	3.96	3.99
Grade level					
9	0.71	0.67	0.69	0.68	0.71
10	0.93	0.77	0.76	0.73	0.75
11	1.40	1.13	1.04	1.02	1.01
12	1.62	1.61	1.50	1.53	1.51

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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school graduates earned 39.7 percent of their occupational credits and 36.2 percent of their family and consumer sciences education credits in the 12th grade, compared with 18.4 percent of their general labor market preparation credits (figure 13 and table A4). In contrast, graduates earned 41.8 percent of their general labor market preparation credits in the 9th grade, in comparison with 16.0 percent of their occupational credits and 23.1 percent of their family and consumer sciences education credits. For 1998 graduates, 65.5 percent (about two-thirds) of occupational coursetaking and 57.0 percent of family and consumer sciences education coursetaking occurred in the 11th and 12th grades, compared with 33.4 percent of general labor market preparation coursetaking.

The 1998 graduates took more occupational coursework than either family and consumer sciences education or general labor market preparation coursework at each grade level in high school (table 3). For example, in the 9th grade, public high school graduates earned on average 0.38 occupational credits, compared with 0.22 credits in general labor market preparation and 0.11 credits in family and consumer sciences education. In the 12th grade, graduates earned on average 1.19 occupational credits, compared with 0.14 credits in general labor market preparation and 0.18 credits in family and consumer sciences education. The 1.19 occupational credits that 1998 graduates earned in the 12th grade were the equivalent of more than one full-year occupational course.

Table 3. Average number of vocational/technical credits earned by public high school graduates, by grade level of course: 1998

	Vocational/technical total	General labor market preparation	Family and consumer sciences education	Occupational education
Total	3.99	0.61	0.51	2.87
Grade level				
9	0.71	0.22	0.11	0.38
10	0.75	0.14	0.11	0.51
11	1.01	0.11	0.11	0.79
12	1.51	0.14	0.18	1.19

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Trends in Family and Consumer Sciences Education and General Labor Market Preparation by Grade Level

The average number of credits that public high school graduates earned in family and consumer sciences education declined by 0.18 credits over the period studied, from 0.69 credits for 1982 graduates to 0.51 credits for 1998 graduates (table 4). This decline occurred mainly in the 9th and 11th grades (0.06 credits in each year).

As reported earlier, the average number of credits that public high school graduates earned in general labor market preparation declined by 0.34 credits over the period studied, from 0.95 credits for 1982 graduates to 0.61 credits for 1998 graduates (table 5). Most of this decline occurred in the 10th, 11th, and 12th grades, where the average credits that public high school graduates earned in general labor market preparation declined by 0.15 credits, 0.10 credits, and 0.07 credits, respectively, between 1982 and 1998. There was no significant change detected in the average number of general labor market preparation credits earned in the 9th grade by graduates over this period.

Trends in Occupational Coursetaking by Grade Level

As reported earlier in this chapter, there was no significant difference in the numbers of occupational credits earned on average by 1982 and 1998 public high school graduates.[22] However,

Table 4. Average number of credits earned in family and consumer sciences education by public high school graduates, by grade level of course: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	0.69	0.57	0.54	0.52	0.51
Grade level					
9	0.17	0.13	0.13	0.12	0.11
10	0.13	0.11	0.09	0.11	0.11
11	0.17	0.14	0.11	0.12	0.11
12	0.22	0.19	0.20	0.17	0.18

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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[22] Although there were some declines for the graduating classes in interim years, the difference in credits earned on average by 1982 and 1998 graduates was not statistically significant.

Table 5. Average number of credits earned in general labor market preparation by public high school graduates, by grade level of course: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	0.95	0.73	0.62	0.64	0.61
Grade level					
9	0.24	0.21	0.22	0.23	0.22
10	0.29	0.22	0.18	0.17	0.14
11	0.21	0.13	0.10	0.11	0.11
12	0.21	0.17	0.11	0.13	0.14

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

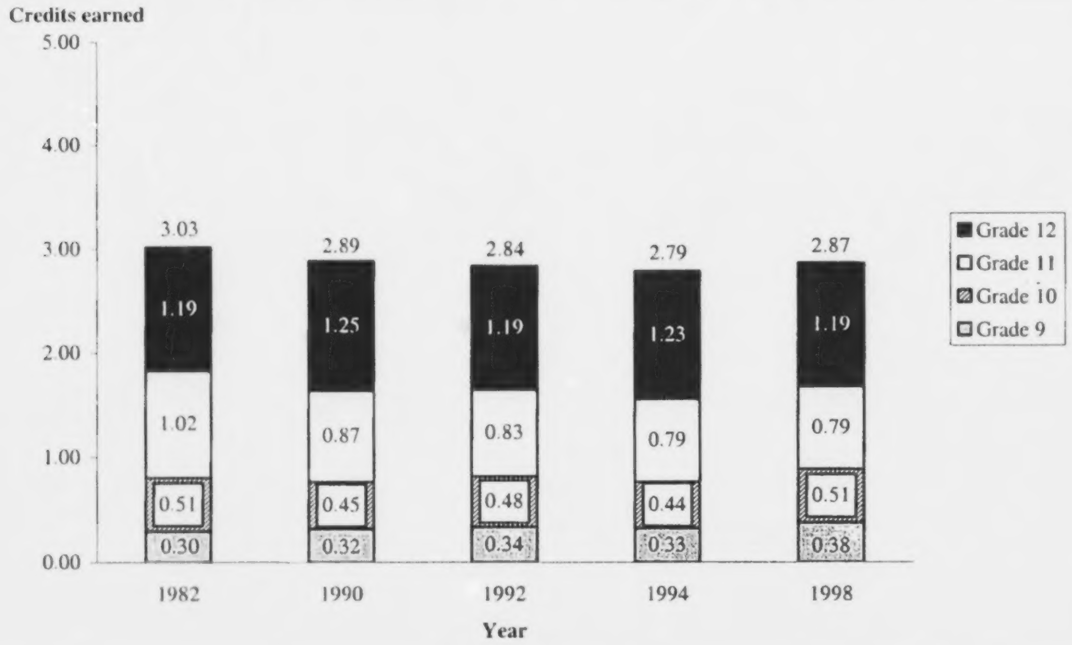
trends in occupational coursetaking varied at the different grade levels over the period studied (figure 14). The 1998 public high school graduates earned on average 0.23 *fewer* occupational credits in the 11th grade and 0.08 *more* occupational credits in the 9th grade than did 1982 graduates. In contrast, there were no statistically significant changes in the average number of occupational credits earned in the 10th and 12th grades by 1982 and 1998 graduates.

Graduates earned more core academic credits in the 11th grade than in any other grade in high school in each year studied. The reduction in occupational coursetaking in the 11th grade may be due to graduates taking additional academic courses over the period in that grade, thereby having less time for occupational coursework. Specifically, 1998 public high school graduates earned 0.84 more credits in core academic subjects (English, mathematics, science, and social studies) in the 11th grade—equivalent to almost one additional full-year core academic course—than did 1982 graduates (table 6).

The decline noted earlier in 9th-grade family and consumer sciences education coursetaking may have made room for some additional occupational coursetaking, making it possible for graduates to shift some of their occupational coursetaking from higher grades (particularly grade 11) to grade 9. Such a shift may have mitigated any overall decline in occupational coursetaking in high school.

As a result of these coursetaking changes in the three vocational/technical subcurricula, the distribution of vocational/technical credits earned across the grade levels shifted somewhat from grade 11 to grade 9. Specifically, comparing 1998 graduates with their 1982 counterparts, the

Figure 14. Average number of occupational credits earned by public high school graduates, by grade level of course: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table 6. Average number of credits earned in core academic subjects by public high school graduates, by grade level of course: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	11.87	13.57	13.88	14.21	14.51
Grade level					
9	3.38	3.59	3.59	3.67	3.73
10	3.15	3.53	3.61	3.70	3.77
11	2.97	3.48	3.59	3.69	3.81
12	2.34	2.97	3.06	3.15	3.21

NOTE: Detail may not sum to totals because of rounding. Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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share of total vocational/technical credits that graduates earned in the 11th grade decreased by 5.1 percentage points over the period, while the share earned in the 9th grade increased by 3.7 percentage points (table A4). (There were no significant changes detected in the shares of vocational/technical credits earned in the 10th and 12th grades.)

Trends in Coursetaking in Occupational Program Areas

As mentioned earlier in the chapter, most public high school graduates in each graduating class studied (between 88.7 percent and 92.2 percent) earned at least some occupational credits in high school (figure 11 and table A2). Similarly, there was no significant difference in the average number of occupational credits earned in high school by 1982 and 1998 graduates (2.87 credits versus 3.03 credits) (figure 9). However, the percentage of public high school graduates who concentrated in occupational education—those who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure 3—declined from 33.7 percent for 1982 graduates to 27.8 percent for 1990 graduates (figure 11 and table A2). As of 1998, 25.0 percent of graduates concentrated in occupational education.[23]

To examine occupational coursetaking in detail, the remainder of this section compares trends in the *breadth* of occupational coursetaking (that is, the percentage of graduates taking at least one course in a program area) and in the *depth* of occupational coursetaking (including both the average credits earned and the percentage of graduates concentrating in a program area) among the 18 narrow program areas in figure 3. Trends in occupational coursetaking varied widely among these program areas.[24] On the one hand, many key measures of participation showed *declines* in coursetaking in materials production (including metals, woods, and plastics), mechanics and repair, business management, and business services. On the other hand, many key measures showed *increases* in coursetaking in computer technology, communications technology, health care, and child care and education. In some of these program areas, both the breadth and depth of coursetaking changed, while in others, patterns were more varied. However, many of the coursetaking measures did not exhibit statistically significant changes between 1982 and 1998. This lack of change could reflect constant rates of coursetaking; however, in some program areas (for example, in personal and other services, construction, and computer technology) small sample sizes may have made it difficult to detect some changes that may have occurred.

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[23] The difference in concentration rates for 1990 and 1998 graduates was not statistically significant.

[24] As explained in chapter I, the majority of occupational concentrators earned 3.0 or more credits in one of the 18 narrow occupational program areas in figure 3. However, some concentrators earned 3.0 or more credits in "mixed" business, technology, precision production, and trade and industry program areas without earning 3.0 or more credits in one of the narrow programs within these broad areas. Where appropriate, tables also provide information on concentrators in the four "mixed" program areas.

An Overview of Program Areas With Declining Coursetaking

The occupational program areas of materials production, business management, and mechanics and repair exhibited declines in both the breadth and depth of coursetaking over the period studied. Comparing the graduating classes of 1982 and 1998, the percentage of public high school graduates who took at least one course declined over the period in materials production (by 8.8 percentage points), business management (by 7.7 percentage points), and mechanics and repair (by 3.1 percentage points) (figure 15 and table A5). Similarly, the average number of credits earned by public high school graduates declined in these three areas (by 0.17 credits, 0.08 credits, and 0.09 credits, respectively) (figure 16 and table A6). The percentage of graduates who concentrated (earned 3.0 or more credits) in the program area also declined by 1.7 percentage points in materials production and 1.2 percentage points in mechanics and repair (figure 17 and table A7). These declines in both the breadth and depth of coursetaking suggest that these program areas—particularly materials production and mechanics and repair—became a relatively less prominent part of occupational education over the period studied. Declines in some of these program areas appear to reflect changes in occupational employment as well; in particular, between 1983 and 1996, precision production, craft, and repair occupations were projected to have below-average growth (Hurst and Hudson 2000).

Paralleling the trends in vocational/technical education and occupational education noted earlier in this chapter, the business services program area exhibited less change in the breadth of coursetaking than in the depth of that coursetaking. There was no significant difference in the percentage of 1982 and 1998 graduates who earned business services credits, a measure of the breadth of this coursetaking. About 42.0 percent of 1982 graduates and 44.0 percent of 1998 graduates earned business services credits in high school (table A5).[25] In contrast, 1998 graduates earned 0.23 fewer credits on average in business services than did 1982 graduates (figure 16 and table A6), and fewer public high school graduates concentrated in business services over that period (a decline of 6.0 percentage points) (figure 17 and table A7). This indicates that the amount, or depth, of graduates' coursetaking in business services declined between 1982 and 1998. In fact, of the 18 narrow occupational program areas, business services exhibited the largest decline in the percentage of graduates concentrating in the program area over the period studied (figure 17 and table A7).

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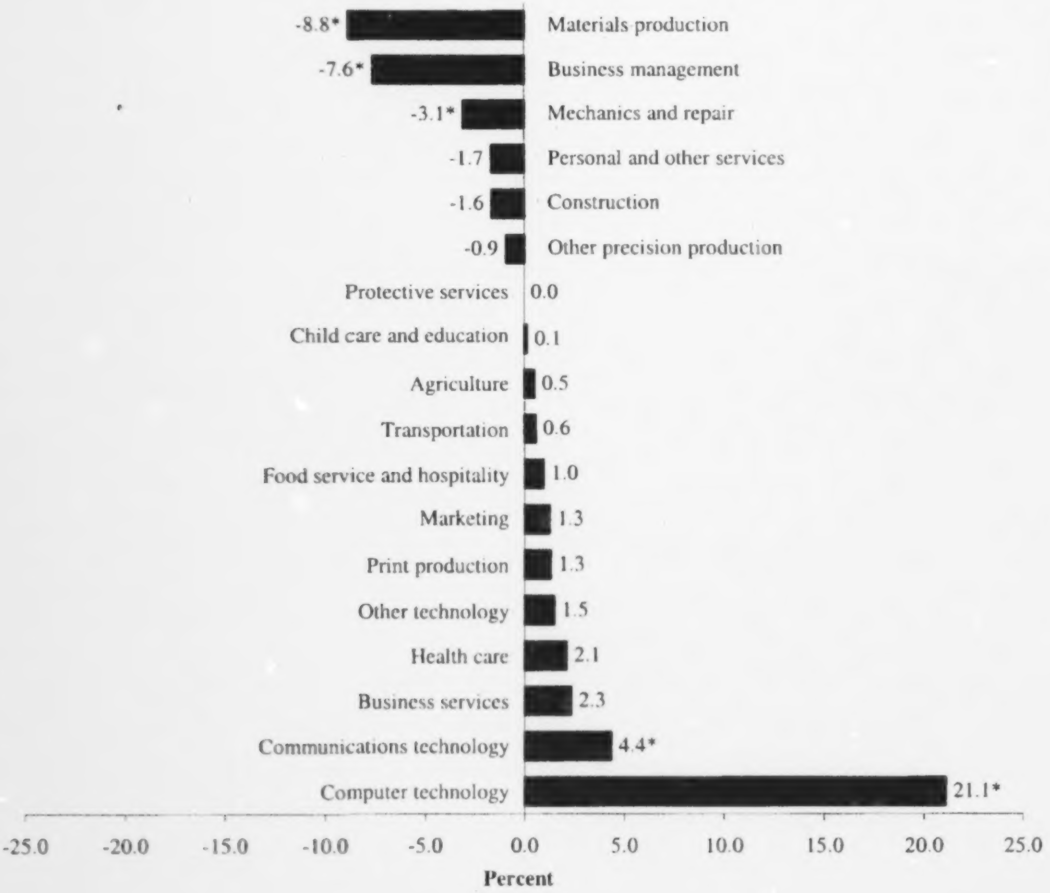
[25] The percentage of graduates earning business services credits actually increased between 1982 and 1994 and then decreased to a level in 1998 that was not statistically different from that in 1982.

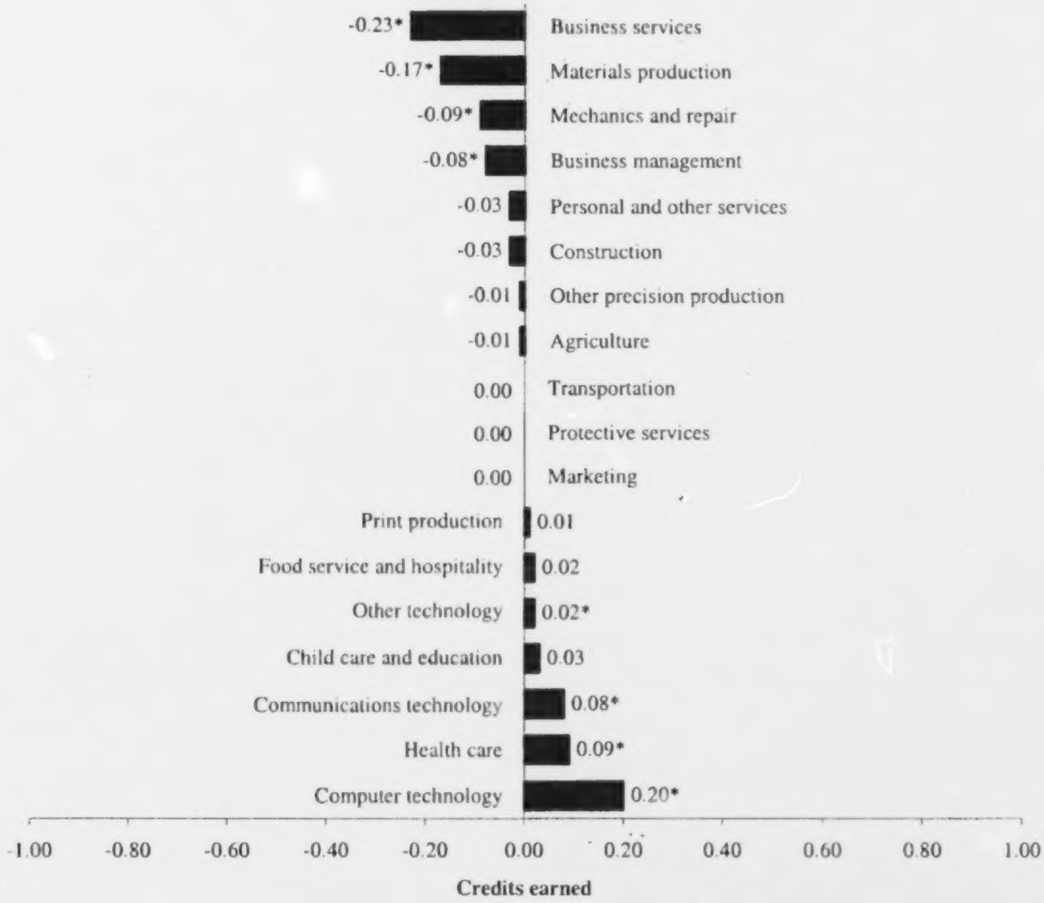
Figure 15. Change in the percentage of public high school graduates taking at least one occupational course, by program area: 1982 and 1998



*These changes between 1982 and 1998 were statistically significant. All other changes in the figure were not statistically significant.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

Figure 16. **Change in the average number of occupational credits earned by public high school graduates, by program area: 1982 and 1998**



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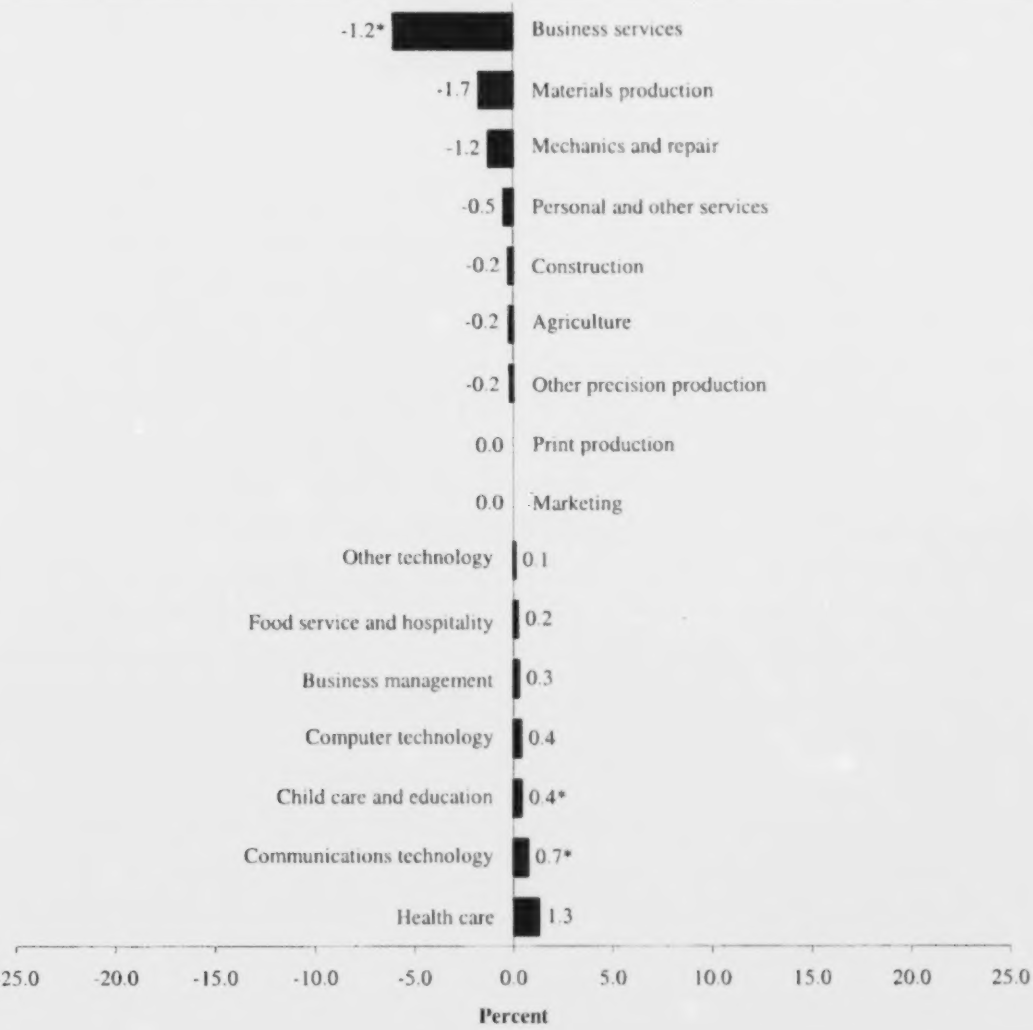
*These changes between 1982 and 1998 were statistically significant. All other changes in the figure were not statistically significant.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

Figure 17. Change in the percentage of public high school graduates concentrating in occupational education, by program area: 1982 and 1998



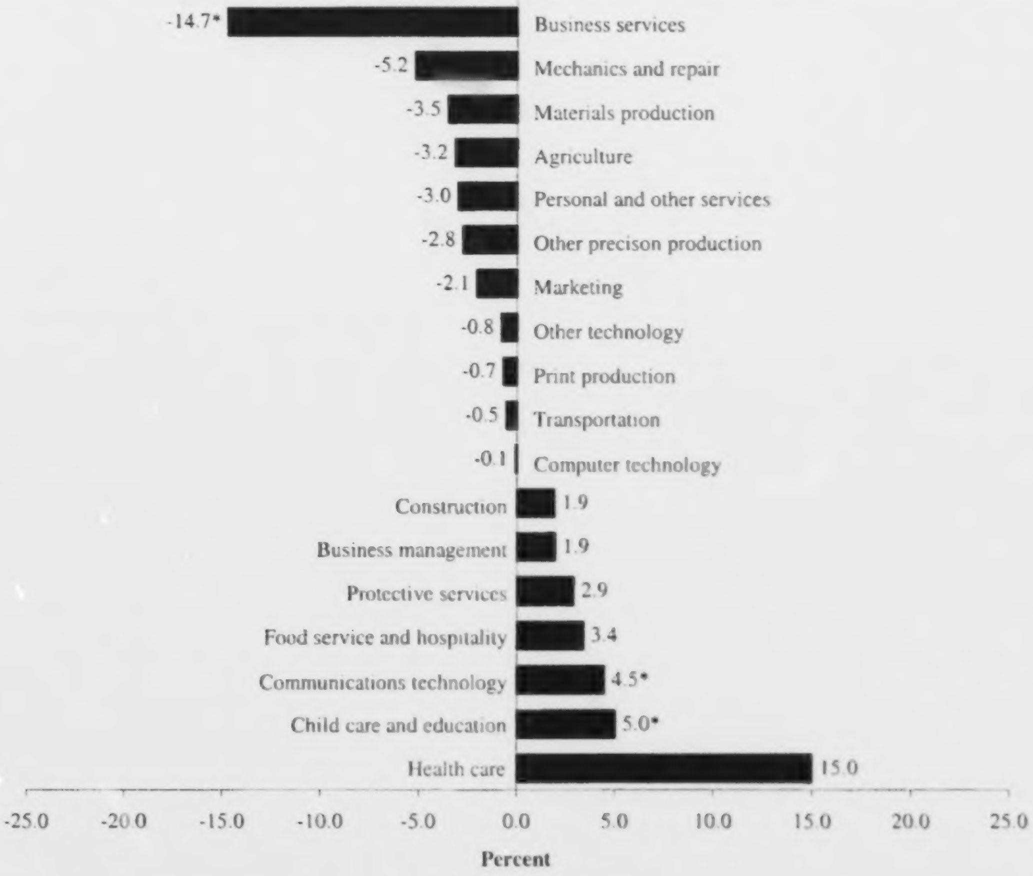
*These changes between 1982 and 1998 were statistically significant. All other changes in the figure were not statistically significant. Health care was not statistically significant due to large standard errors.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed. Because percentages for transportation and protective services were too small to report in 1982, the change between 1982 and 1998 could not be calculated for these two program areas.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

Thus, in the business services program area (unlike materials production and mechanics and repair), declines in coursetaking did not result from fewer students taking business services courses in high school, but from business services coursetakers taking less extensive coursework in the program area. Specifically, the proportion of business services coursetakers who concentrated (earned 3.0 or more credits) in the program area in high school declined by 14.7 percentage points between 1982 and 1998 (figure 18 and table A8).

Figure 18. Change in the percentage of occupational coursetakers concentrating in occupational education, by program area: 1982 and 1998



*These changes between 1982 and 1998 were statistically significant. All other changes in the figure were not statistically significant. Health care was not statistically significant due to large standard errors.

NOTE: Occupational coursetakers earned greater than 0.0 credits in occupational education. Details are provided for occupational coursetakers who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

In addition, declines between 1982 and 1998 in business services coursetaking were due primarily to declines in average credits earned by graduates in *noncomputer-related* business services courses (including bookkeeping, accounting, secretarial, and general office procedures courses) (table 7). In contrast, average credits earned in *computer-related* business services courses increased over the same period. Overall declines in business services coursework coincided with projections of below-average growth for secretary and typist occupations (Hurst and Hudson 2000).

Table 7. Average credits earned in business services by public high school graduates, by computer-related area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	0.79	0.72	0.65	0.71	0.56
Noncomputer-related	0.78	0.44	0.36	0.33	0.23
Computer-related	0.01	0.28	0.29	0.38	0.33

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Despite the declines in the amount of business services coursetaking over the period studied, 1998 public high school graduates earned more credits in business services than in any other occupational program area in high school (figure 19 and table A6). Similarly, 1998 graduates were more likely to concentrate in business services than in most other occupational program areas (figure 20 and table A7).[26] Among 1998 graduates, 13.1 percent of all occupational concentrators were in the business services program area (tables 8 and A9).

An Overview of Program Areas With Increasing Coursetaking

The occupational program areas of computer technology and communications technology generally exhibited increases in both the breadth and depth of coursetaking over the period studied. Comparing the classes of 1982 and 1998, the percentage of public high school graduates who earned credits in computer technology increased by 21.1 percentage points, and the percentage who earned credits in communications technology increased by 4.4 percentage points (figure 15 and table A5). Similarly, the average number of credits earned by public high school graduates

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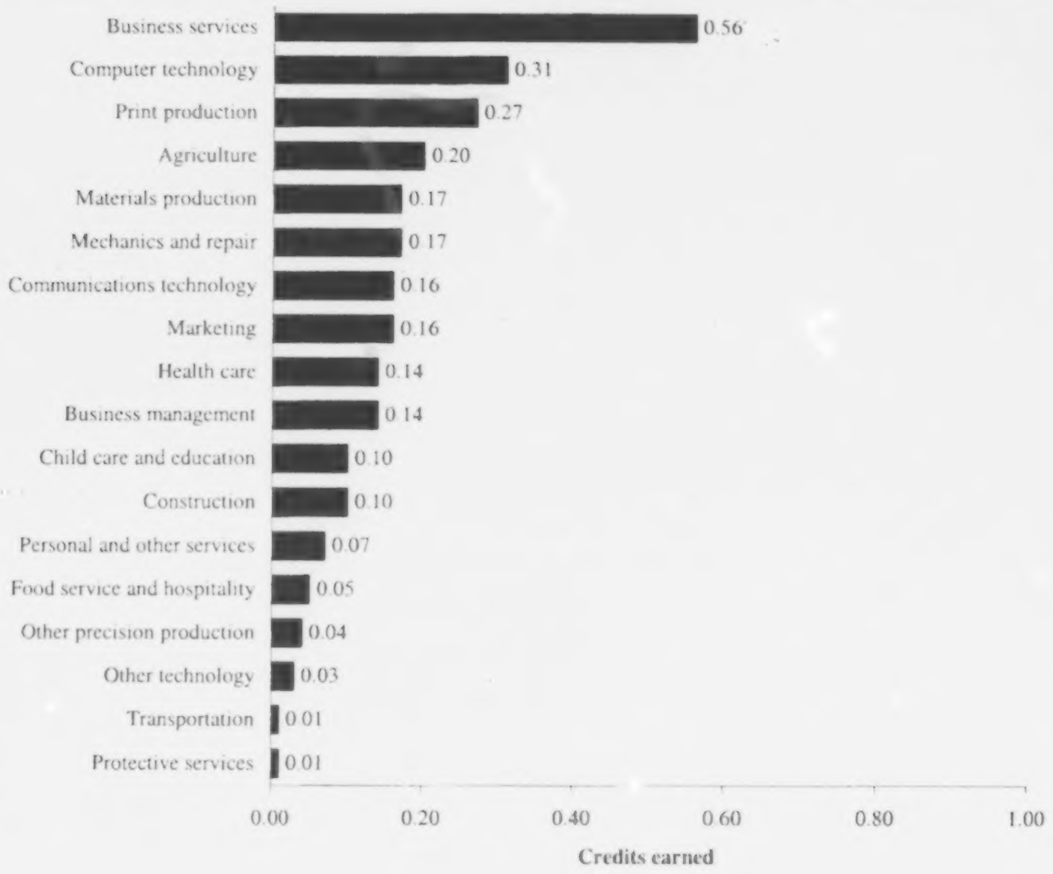
[26] The percentage of 1998 graduates concentrating in business services was not statistically higher than the percentage of 1998 graduates concentrating in agriculture, print production, and health care.

Figure 19. Average number of occupational credits earned by public high school graduates, by program area: 1998



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

increased in these two program areas over the period (by 0.20 credits and 0.08 credits, respectively) (figure 16 and table A6).[27] In both cases, increases were greater for computer technology than for communications technology. Finally, the percentage of graduates who concentrated (earned 3.0 or more credits) in communications technology in high school also increased by 0.7 percent (figure 17 and table A7).

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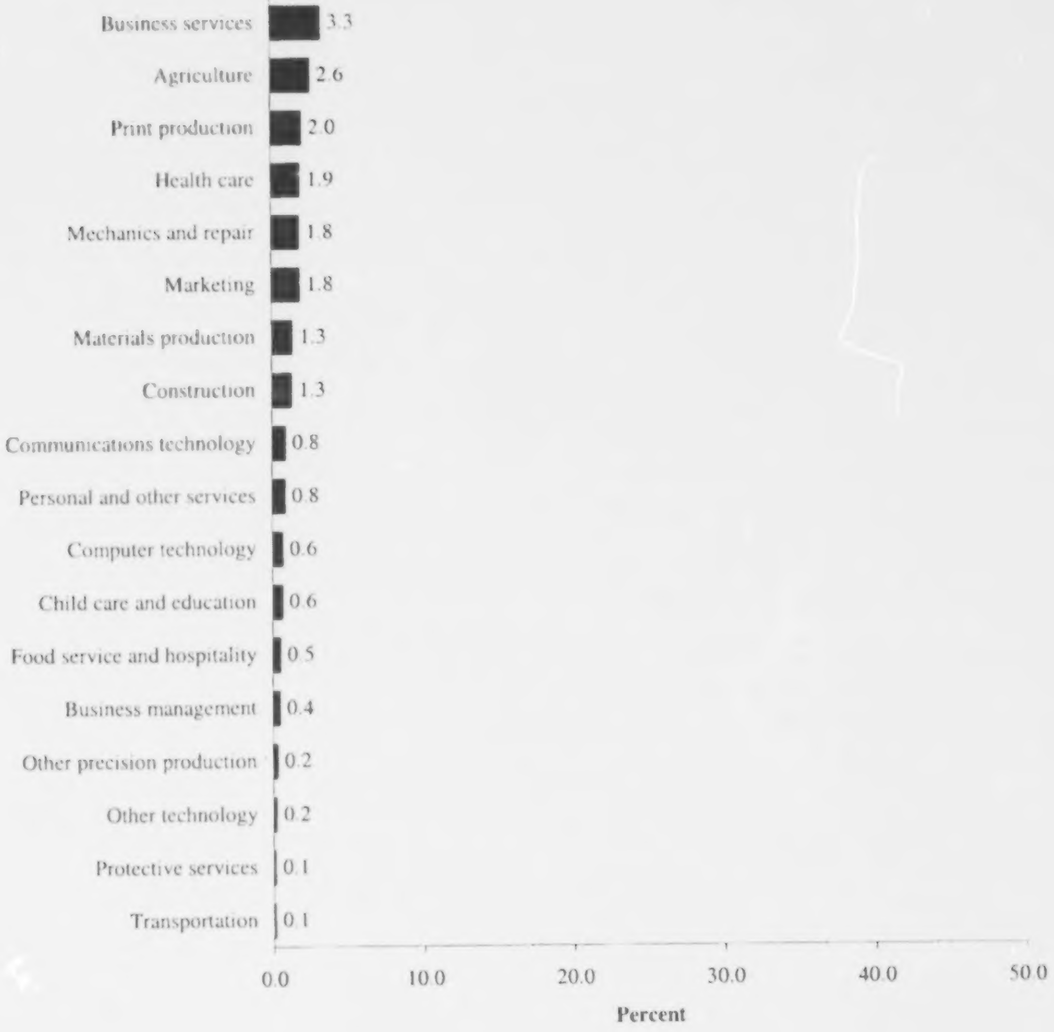
[27] The average number of credits earned in the "other technology" area also increased (by 0.02 credits) between 1982 and 1998, although none of the other coursetaking changes discussed in this section was statistically significant in this program area.

Figure 20. Percentage of public high school graduates concentrating in occupational education, by program area: 1998



NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table 8. Percentage distribution of occupational concentrators, by program area: 1998

	1998
Total	100.0
Transportation	0.3
Protective services	0.3
Other technology	0.6
Other precision production	0.9
Business management	1.7
Food service and hospitality	1.8
Child care and education	2.4
Mixed technology[1]	2.4
Computer technology	2.5
Personal and other services	3.2
Communications technology	3.4
Mixed business[1]	4.6
Construction	5.1
Materials production	5.3
Mixed precision production[1]	5.5
Mixed trade and industry[1]	7.0
Marketing	7.2
Mechanics and repair	7.2
Health care	7.4
Print production	7.9
Agriculture	10.2
Business services	13.1

[1] "Mixed" categories include students who earned 3.0 or more credits in one of the broad occupational program areas listed, but fewer than 3.0 credits in any one of the associated sub-areas. That is, students earned 3.0 or more credits in business, but fewer than 3.0 credits in either business management or business services; 3.0 or more credits in technology, but fewer than 3.0 credits in either communications technology, computer technology, or "other" technology; 3.0 or more credits in precision production, but fewer than 3.0 credits in either materials production, print production, or "other" production; or 3.0 or more credits in trade and industry, but fewer than 3.0 credits in either construction, mechanics and repair, transportation, or precision production.

NOTE: Occupational concentrators earned 3.0 or more credits in the occupational program areas listed. In the few cases where graduates earned 3.0 or more credits in more than one program area, they were assigned to the area in which they earned the most credits. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

The increases noted in computer technology coursetaking suggest that this program area became a relatively more prominent part of occupational education over the period studied. About one-third (34.3 percent) of 1998 public high school graduates earned credits in computer technology courses in high school, a higher percentage than that in all other program areas except business services (figure 21 and table A5).[28] Similarly, 1998 graduates earned more credits on average in computer technology than in most other program areas (figure 19 and table

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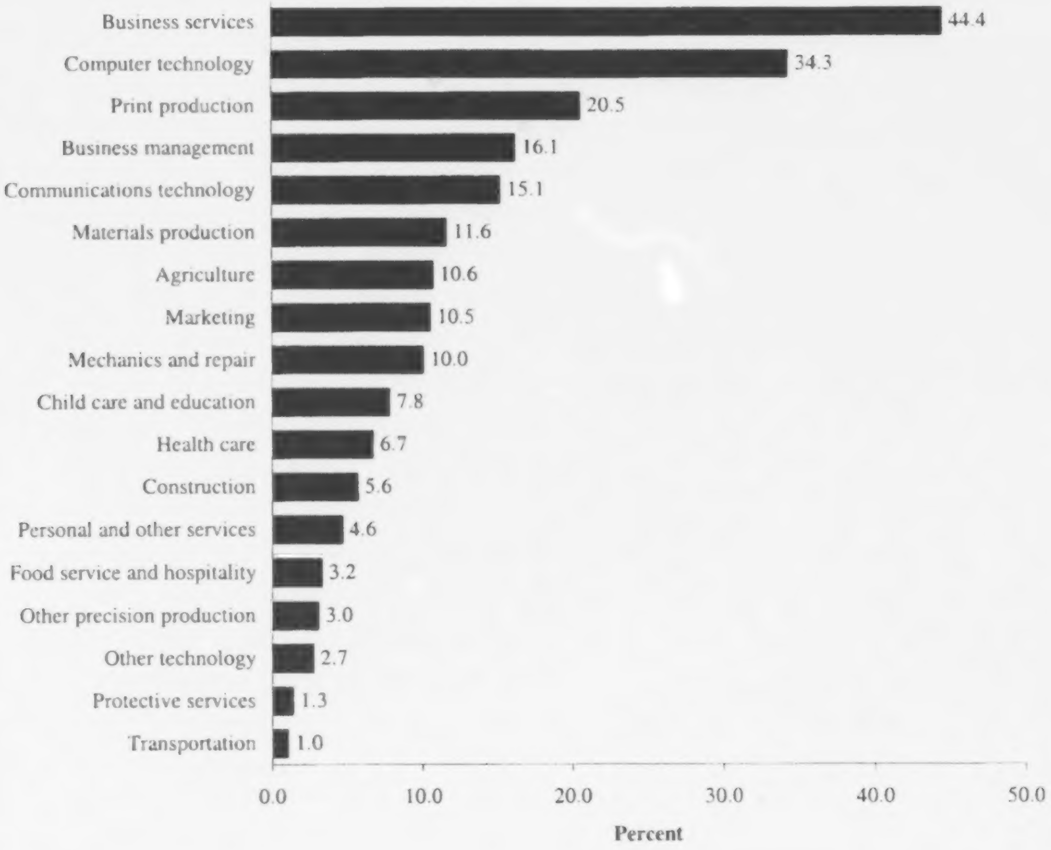
[28] The difference between computer technology and business services was not statistically significant.

Figure 21. Percentage of public high school graduates earning occupational credits, by program area: 1998



SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

A6).[29] However, the percentage of public high school graduates who concentrated in computer technology in high school was relatively low (figure 20 and table A7).[30] Among 1998 graduates, 2.5 percent of all occupational concentrators were in computer technology (tables 8 and A9).

While computer technology coursetaking became more widespread over the period studied, evidence about the depth of that coursetaking was mixed. The average number of credits that graduates earned in computer technology in high school increased, but the percentage of graduates concentrating in computer technology did not. Among 1998 graduates, 1.9 percent of computer technology coursetakers concentrated in this program area in high school, a lower occupational concentration rate than that for coursetakers in most other program areas (figure 22 and table A8).[31]

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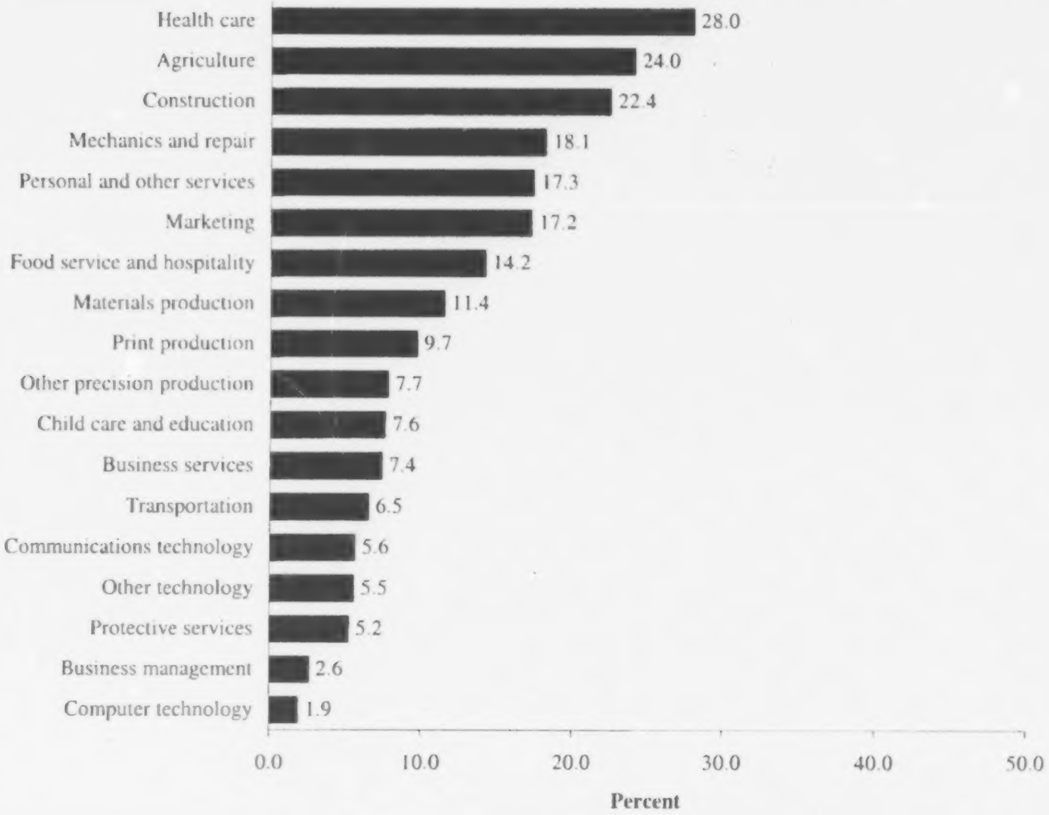
[29] The exceptions were business services, agriculture, and print production. The average number of credits earned by 1998 graduates in agriculture and print production was not statistically different from that earned in computer technology by 1998 graduates. In addition, 1998 graduates earned more credits on average in business services than in computer technology.

[30] Rates of concentrating in a program area were higher in business services (3.3 percent), marketing (1.8 percent), mechanics and repair (1.8 percent), and print production (2.0 percent) than in computer technology (0.6 percent). All other differences between computer technology and other program areas were not statistically significant.

Figure 22. Percentage of occupational coursetakers concentrating in occupational education, by program area: 1998



NOTE: Occupational coursetakers earned greater than 0.0 credits in occupational education. Details are provided for occupational coursetakers who concentrated (earned 3.0 or more credits) in the narrow program areas in which they took courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

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[31] The percentage of computer technology coursetakers who concentrated in this program area was not statistically different from the percentage of coursetakers concentrating in business management, protective services, other precision production, transportation, and other technology areas.

As with computer technology, the increases in coursetaking noted in communications technology suggest that this program area also became a relatively more prominent part of occupational education over the period studied, although the breadth of communications technology coursetaking was less extensive than that of computer technology. About one in seven 1998 public high school graduates (15.1 percent) earned credits in communications technology, compared with one-third (34.3 percent) in computer technology (figure 21 and table A5).

There is mixed evidence about how communications technology and computer technology compared in terms of the depth of coursetaking. The 1998 public high school graduates earned about half the number of credits on average in communications technology in high school as they did in computer technology (0.16 credits versus 0.31 credits) (figure 19 and table A6). However, the percentage of 1998 graduates who concentrated in communications technology (0.8 percent) was not statistically different from the percentage who concentrated in computer technology (0.6 percent) (figure 20 and table A7). Although fewer 1998 graduates took communications technology courses than computer technology courses in high school, graduates who took communications technology courses were more likely than computer technology coursetakers to concentrate (earn 3.0 or more credits) in their respective program areas. Specifically, among 1998 graduates, 5.6 percent of communications technology coursetakers concentrated in their program area in high school, while 1.9 percent of computer technology coursetakers did so (figure 22 and table A8).

As explained in chapter III, the 1998 Secondary School Taxonomy (SST) classifies computer-related courses according to content rather than pedagogy and includes some courses under the computer technology occupational program area that may have been taught in mathematics or other departments. Consequently, courses classified by the SST under computer technology may not constitute planned sequences of occupational courses to the same extent that courses in other occupational program areas do. It is not possible to determine from the available data to what extent the lower concentration rate among computer technology coursetakers than among communications technology coursetakers may be due to this difference in classification or to other factors.

In addition to increases in coursetaking in the computer and communications technology program areas, both health care and child care and education exhibited some increase in the depth—but not the breadth—of coursetaking over the period studied. The percentage of 1982 public high school graduates earning credits in health care in high school was not statistically different from the percentage of 1998 graduates earning health care credits (4.5 percent and 6.7 percent, respectively) (figure 15 and table A5). Similarly, the percentage of 1982 graduates earning credits in child care and education in high school was not statistically different from the percentage of 1998 graduates earning such credits (7.6 percent and 7.8 percent, respectively). In contrast, comparing the classes of 1982 and 1998, the average number of credits earned by graduates increased in health care by 0.09 credits over the period (figure 16 and table A6), equivalent to health care coursetakers taking about one additional health care course over the period. Additionally, the percentage of graduates who concentrated in child care and education in high school increased by 0.4 percentage points (figure 17 and table A7).

To some extent, the increases in occupational coursetaking discussed in this section reflect changes in employment over the period studied. Projected demand for workers in technical and related support occupations, health service occupations, and child care and teacher aide occupations increased at above-average rates between 1983 and 1996 (Hurst and Hudson 2000).

A Closer Look at Trends in Occupational Concentrating

Public high school graduates were less likely to concentrate in occupational education in high school over the period studied. This trend was not due to an overall decline in occupational coursetaking, however. As mentioned earlier, there was no significant difference between the percentage of 1982 public high school graduates taking occupational courses in high school and the percentage of 1998 graduates taking such courses (88.7 percent and 90.7 percent, respectively) (figure 11 and table A2). Similarly, there was no significant difference between the percentages of 1982 and 1998 public high school graduates earning 3.0 or more credits in occupational education in high school (defined as "occupational investors" in chapter I) (46.2 percent and 43.8 percent, respectively). However, the percentage of graduates who concentrated in occupational education—those who earned 3.0 or more credits in one of the 10 broad occupational program areas in figure 3—declined from 33.7 percent for 1982 graduates to 25.0 percent for 1998 graduates. This decline meant that graduates earning 3.0 or more occupational credits were less likely to concentrate that coursetaking in an occupational program area over the period studied. Specifically, the percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education declined from 72.8 percent for 1982 graduates to 59.1 percent for 1992 graduates. Among 1998 graduates, 57.0 percent of occupational investors concentrated in occupational education (figure 23 and table A10).[32]

Additionally, the percentage of public high school graduates who completed an advanced occupational concentration—occupational concentrators who earned at least 1.0 credit in advanced coursework in their program area—declined from 24.0 percent for 1982 graduates to 16.1 percent for 1990 graduates. For the class of 1998, 14.4 percent of graduates completed an

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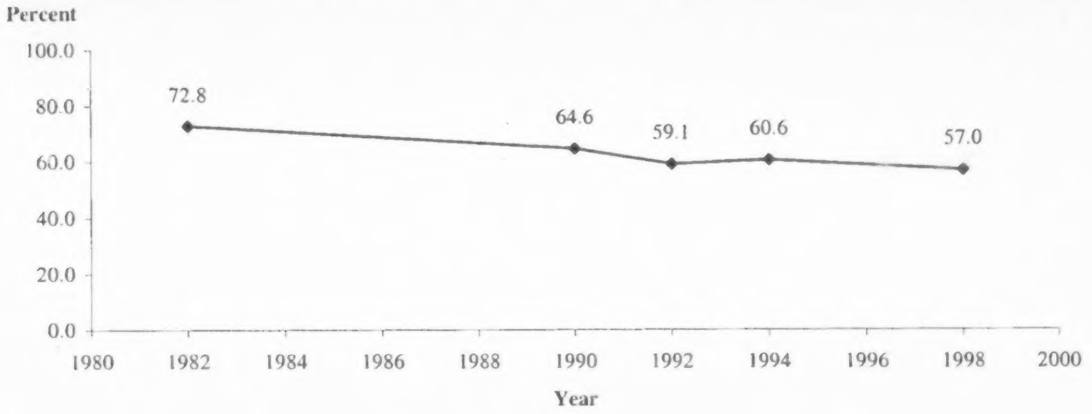
[32] The difference between 1992 and 1998 graduates in the concentration rates of occupational investors was not statistically significant.

Figure 23. Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated those credits in a single occupational program area: Various years, 1982–98



NOTE: Concentrating in occupational education refers to earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

advanced concentration (figure 11 and table A2).[33] Part of this decline in advanced occupational concentrating was due to the fact that graduates were less likely to concentrate in occupational education in general over the period studied. However, the percentage of occupational concentrators who completed an advanced concentration in their program area also declined from 69.9 percent for 1982 graduates to 55.9 percent for 1990 graduates, after which no significant changes were detected.[34] Among 1998 graduates, 56.3 percent of concentrators completed an advanced occupational concentration (figure 24).

What types of occupational courses did these students take instead of completing concentrated or advanced occupational coursework in high school? To answer this question, it is most meaningful to restrict the analysis to occupational investors and concentrators, respectively. The prerequisite for concentrating one's occupational coursework in a single program area is taking at least 3.0 occupational credits. Similarly, the prerequisite for completing an advanced concentration is concentrating in occupational education. Without these restrictions, the analysis of shifting

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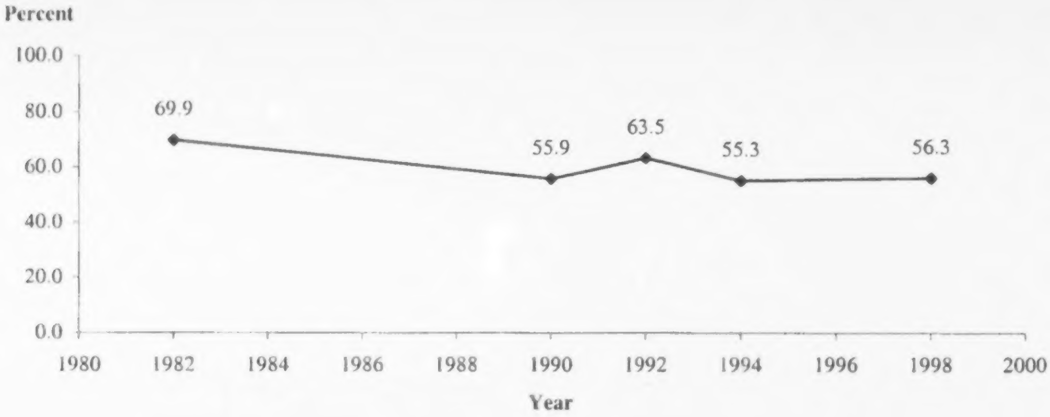
[33] The difference in advanced concentration rates for 1990 and 1998 graduates was not statistically significant.

[34] Although the percentage of occupational concentrators who completed an advanced concentration increased from 1990 to 1992, neither the 1990 nor 1992 percentage was statistically different from the corresponding 1998 percentage.

Figure 24. **Percentage of occupational concentrators completing advanced coursework in their area of concentration: Various years, 1982–98**



NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

coursework becomes confounded with general changes in occupational coursetaking over the period studied.

Shifts Away From Concentrated Coursetaking

What types of occupational courses did 1998 graduates who earned 3.0 or more occupational credits (occupational investors) take instead of concentrating this coursetaking in an occupational program area?[35] In order to understand changes in coursetaking patterns in some detail, the report compared trends in coursetaking and concentrating in the 18 narrow program areas in figure 3. Specifically, comparing changes in the percentage distributions of occupational investors who concentrated in occupational education and of the occupational credits that investors earned in the 18 program areas offers some insights into the changing nature of occupational coursetaking over the period studied.

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[35] As explained in chapter I, occupational concentrators are a subset of all graduates who earned 3.0 or more occupational credits (occupational investors).

Comparing the classes of 1982 and 1998, the percentage of occupational investors who concentrated in business services declined more steeply than did the share of total occupational credits earned by these investors that were business services credits (a decline of 12.6 percentage points versus 7.9 percentage points) (figure 25 and tables A11 and A12). This pattern means that, over time, occupational investors reduced their concentrating more than they reduced their average coursetaking in business services. In contrast, over the same period, the share of total occupational credits earned by occupational investors that were computer technology and communications technology credits increased more steeply than did the percentage of investors who concentrated in these technology programs (by 6.1 percentage points versus 0.9 percentage points for computer technology and by 3.5 percentage points versus 1.6 percentage points for communications technology) (figure 25 and tables A11 and A12). This pattern means that, over time, occupational investors increased their coursetaking more than they increased their concentrating in these technology programs, particularly in computer technology.[36]

There were no significant differences between the two trend measures in the occupational program areas of mechanics and repair, materials production, health care, and child care and education. The first two programs exhibited declines both in the percentage of occupational investors who concentrated and in the shares of total occupational credits that occupational investors earned in these program areas, while the latter two programs exhibited increases on both measures. In most of the remaining occupational program areas, there were neither significant changes over time in the percentage of occupational investors concentrating nor in the shares of total occupational credits that occupational investors earned in the program areas.[37]

Together, these findings indicate that some of the decline in occupational investors' propensity to concentrate in occupational education was due to a shift from concentrating in business services to taking more communications technology and computer technology courses.[38] That is, occupational investors as a group took fewer business services courses—specifically, fewer noncomputer-related business services courses—in high school over the period studied,

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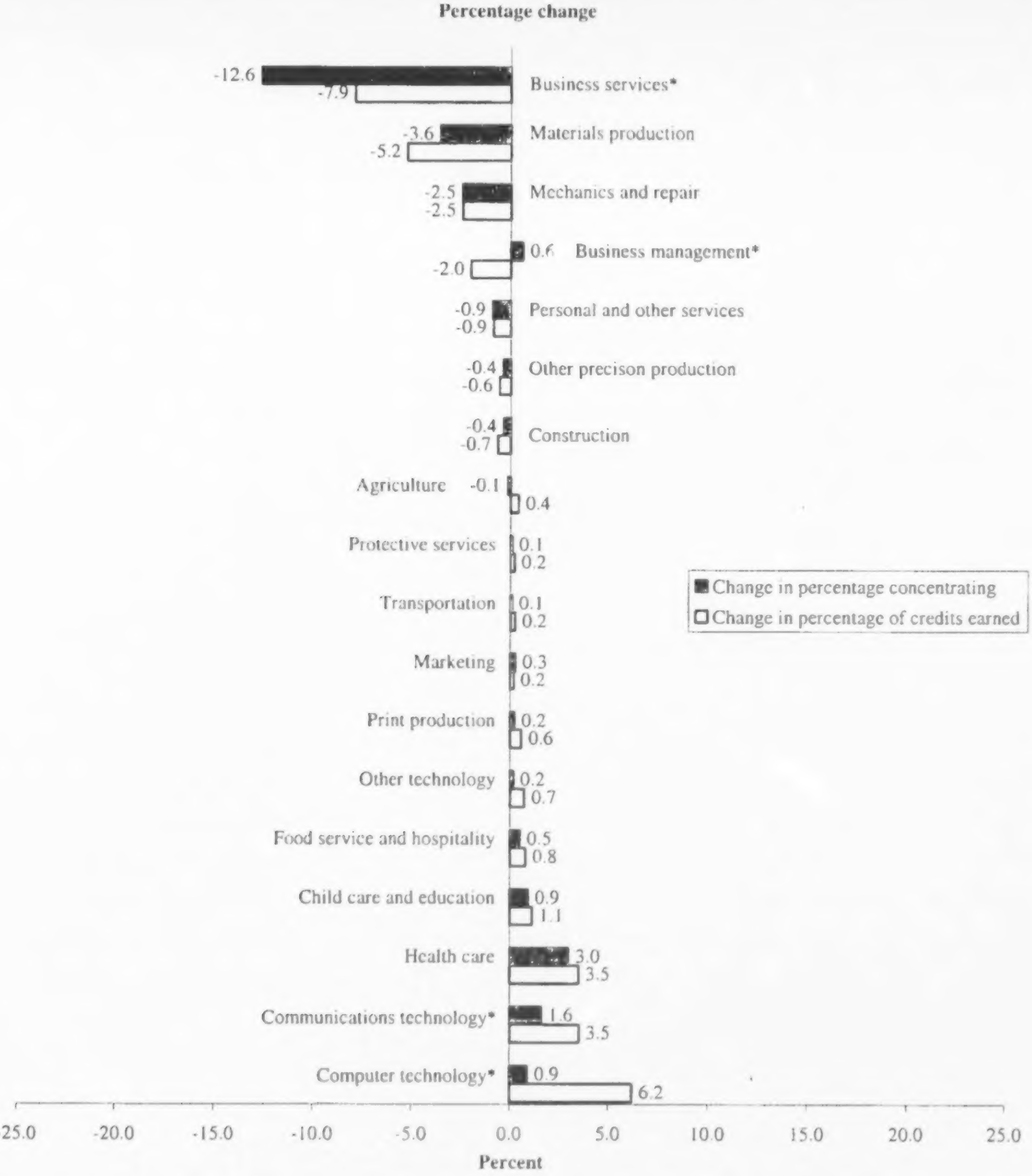
[36] In addition, occupational investors decreased their coursetaking more than they decreased their concentrating in the business management program area. In this case, no significant difference was detected in the percentage of 1982 and 1998 occupational investors who concentrated in business management, while the share of total occupational credits earned by these investors that were business management credits declined significantly over the period.

[37] Program areas not exhibiting significant changes over time on either measure included agriculture, marketing, protective services, construction, print production, other precision production, transportation, food service and hospitality, and personal and other services. Although the share of total occupational credits that occupational investors earned in "other technology" increased significantly for 1998 graduates compared with 1982 graduates, there was no significant difference in the percentage of occupational investors who concentrated in this program area between 1982 and 1998, and there was no significant difference between the two trend measures for the program area.

[38] The discussion of shifting coursetaking in this section refers to changes among occupational investors as a group, not to individual students shifting from one program area to another.

Figure 25. **Changes in the percentage distributions of occupational credits earned by occupational investors and of occupational investors concentrating in occupational education, by program area: 1982 and 1998**



*The differences between change in percentage concentrating and change in percentage of credits earned for these program areas were statistically significant. All other differences in the figure were not statistically significant.

NOTE: Occupational investors earned 3.0 or more credits in occupational education, regardless of whether they concentrated their occupational coursetaking in a single program area. Details are provided for occupational investors who concentrated (earned 3.0 or more credits) in the narrow program areas listed and for the percentage of occupational credits they earned in those program areas.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

enough to reduce their rate of concentrating in this program area at a relatively high rate. At the same time, they took additional communications technology and computer technology courses—but not enough to increase their rates of concentrating on a par with their increased coursetaking in these program areas.

Chapter III discusses in some detail graduates' computer-related coursetaking. Table 9 shows the three occupational program areas in which students took such coursework in high school. As the table indicates, the credits that occupational investors earned in *noncomputer-related* business services courses (such as bookkeeping, accounting, secretarial, and general office procedures courses) decreased by 0.88 credits on average, from 1.27 credits for 1982 graduates to 0.39 credits for 1998 graduates. At the same time, the credits that these investors earned in *computer-related* business services courses increased by 0.44 credits. The credits that occupational investors earned on average in computer technology and in computer-related drafting/graphics also increased (by 0.27 credits and 0.10 credits, respectively) over the period studied. Thus, the decline in occupational investors' propensity to concentrate in business services coincided with an increase in their total computer-related coursetaking within the occupational education curriculum.

Table 9. Average credits earned in computer-related occupational courses and in business services courses by graduates earning 3.0 or more occupational credits, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Computer-related, total	0.16	0.78	0.90	0.83	0.97
Business services[1]	0.02	0.41	0.41	0.51	0.46
Drafting/graphics[1]	‡	0.02	0.03	0.05	0.10
Computer technology	0.14	0.35	0.46	0.28	0.41
Business services, total[1]	1.29	1.19	1.04	1.11	0.85
Computer-related	0.02	0.41	0.41	0.51	0.46
Noncomputer-related	1.27	0.76	0.62	0.60	0.39

‡Reporting standards not met. (Too few cases.)

[1] Only a subset of courses in the business services and drafting/graphics areas were considered to be computer-related. See figure 33.

NOTE: Detail may not sum to totals because of rounding.

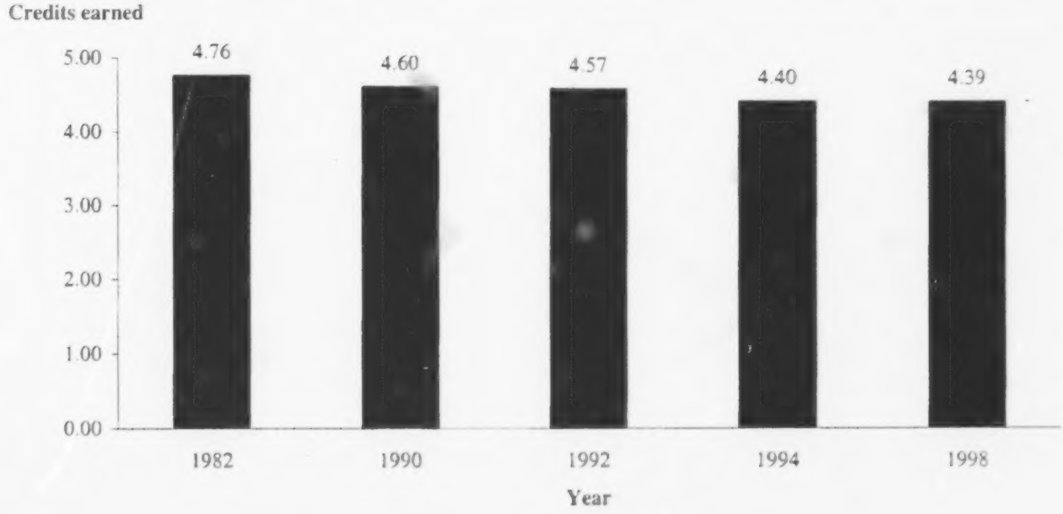
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Shifts Away From Completing an Advanced Concentration

What types of occupational courses did 1998 occupational concentrators take instead of completing advanced coursework in their area of concentration? As explained in chapter I, occupational courses are categorized into first-level, second- or higher-level, cooperative education, and specialty courses, with the first three categories usually representing sequential coursetaking. Students may take specialty courses to obtain more specialized occupational training or related skills not taught through sequential courses. For purposes of this analysis, second- or higher-level and cooperative education courses were considered to represent *advanced* coursework in a program area.

Comparing the classes of 1982 and 1998, occupational concentrators—graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3—earned on average 0.37 fewer credits in their respective areas of concentration by the end of the period (figure 26 and table A13). This decrease was due primarily to a decline in second- or higher-level

Figure 26. Average number of credits earned by occupational concentrators in their area of concentration: Various years, 1982–98



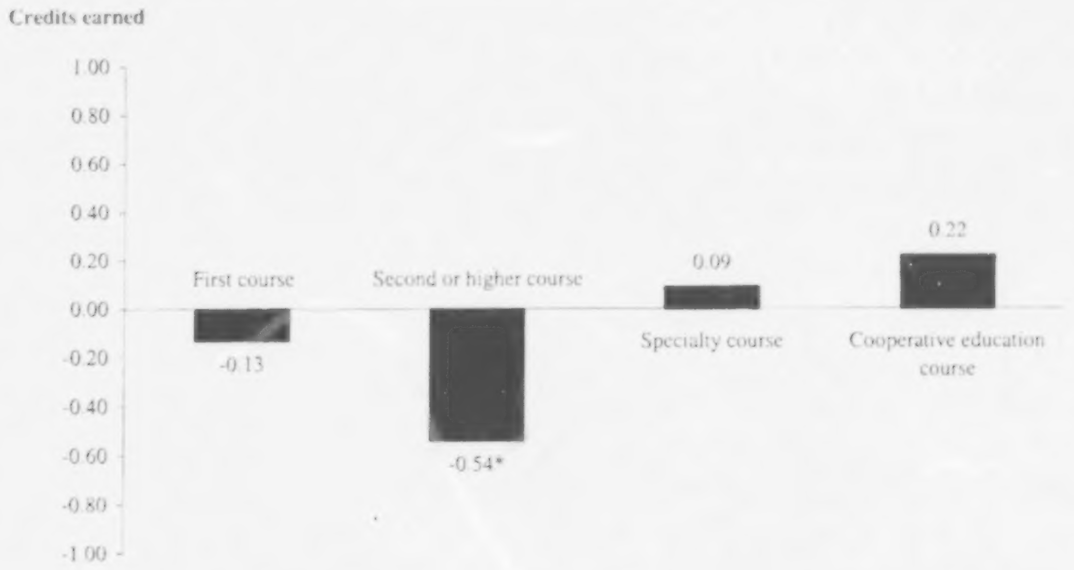
NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

coursetaking. Specifically, 1998 occupational concentrators earned 0.54 fewer credits in second- or higher-level courses in their areas of concentration than did 1982 graduates, equivalent to about one less half-year course (figure 27 and table A13). While credits earned in first-level courses also appeared to decrease and credits earned in cooperative education and in specialty courses appeared to increase, these changes were not statistically significant.

Because of these changes in the types of courses taken, occupational concentrators shifted the distribution of their coursetaking somewhat away from second- or higher-level courses toward specialty courses in their respective areas of concentration over the period studied.[39] Comparing the classes of 1982 and 1998, the share of total credits earned by occupational

Figure 27. Change in the average number of credits earned by occupational concentrators in their area of concentration, by level of course: 1982 and 1998



*This change between 1982 and 1998 was statistically significant. All other changes in the figure were not statistically significant.

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

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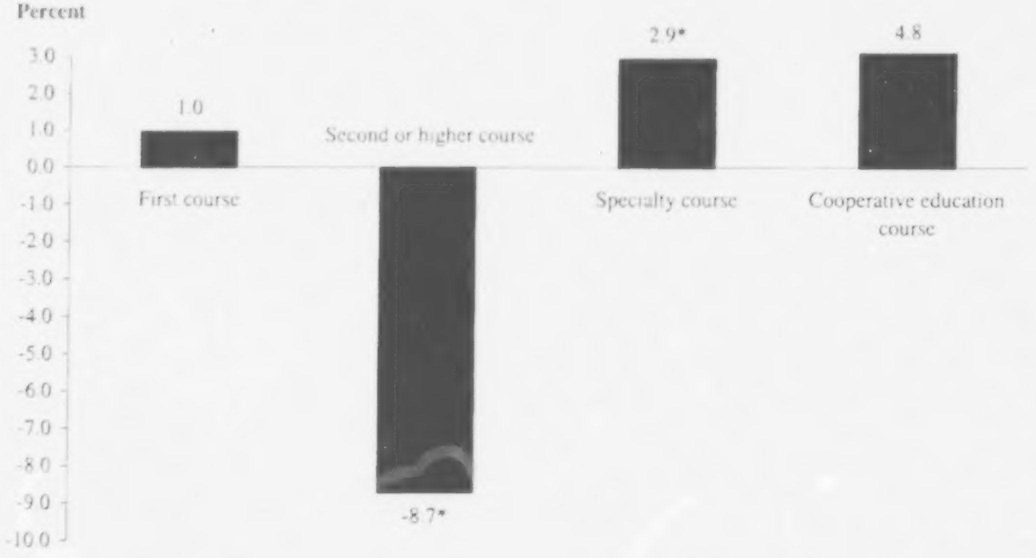
[39] The discussion of shifting coursetaking in this section refers to changes among occupational concentrators as a group, not to individual students shifting from one type of course to another.

concentrators in their areas of concentration that were second- or higher-level credits decreased by 8.7 percentage points (figure 28 and table A14). Over the same period, the share of total credits earned by occupational concentrators in their areas of concentration that were specialty credits increased by 2.9 percentage points. (Again, changes in first-level and cooperative education courses were not statistically significant.)

The decline in 11th-grade occupational coursetaking discussed earlier in the chapter may have affected second- or higher-level occupational coursetaking more than other occupational coursetaking. In some schools, the second course in an occupational sequence occurs in the 11th grade, with first-level courses occurring in the 10th grade and cooperative education courses in the 12th grade.

Figure 28. Change in the percentage distribution of credits earned by occupational concentrators in their area of concentration, by level of course: 1982 and 1998



*This change between 1982 and 1998 was statistically significant. All other changes in the figure were not statistically significant.

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, and High School Transcript Study (HSTS), 1998.

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Trends in Work-Based Learning

Background and Definitions

Work-based learning is a common component of vocational/technical education in high school. Until recent years, the main forms of work-based learning have been general work experience and cooperative education.[40] General work experience awards school credit for work that is not connected to a specific occupational program. Traditionally, general work experience allowed students who might otherwise drop out of school to earn credit toward graduation for their employment. In other cases, students gain general work or leadership experience or explore career options through work. Typically, however, general work experience is not linked to classroom learning.

In contrast, cooperative education awards school credit for work experience that is related to a student's occupational program. Cooperative education is usually more formal than general work experience. Typically, students are placed in cooperative education jobs rather than find their own employment. The teacher and employer usually sign an agreement covering the nature of the work-based placement, with employers agreeing to evaluate students on their work performance. Typically, cooperative education alternates work placements and classroom time. The degree and nature of the work and classroom linkages involved in cooperative education vary, and it is not possible to determine from transcripts the particular configuration of such a course.

Although other forms of work-based learning exist, this report focuses on trends in general work experience and cooperative education because these types of work-based learning traditionally are awarded school credit and recorded on transcripts.[41]

Trends in Overall Work-Based Learning

About one-third (31.6 percent) of 1998 public high school graduates took at least some work-based learning courses in high school (figure 29). There was no significant difference in the percentage of graduates taking cooperative education (16.3 percent) and general work experience courses (18.9 percent).[42] On average, 1998 public high school graduates earned 0.53 credits in

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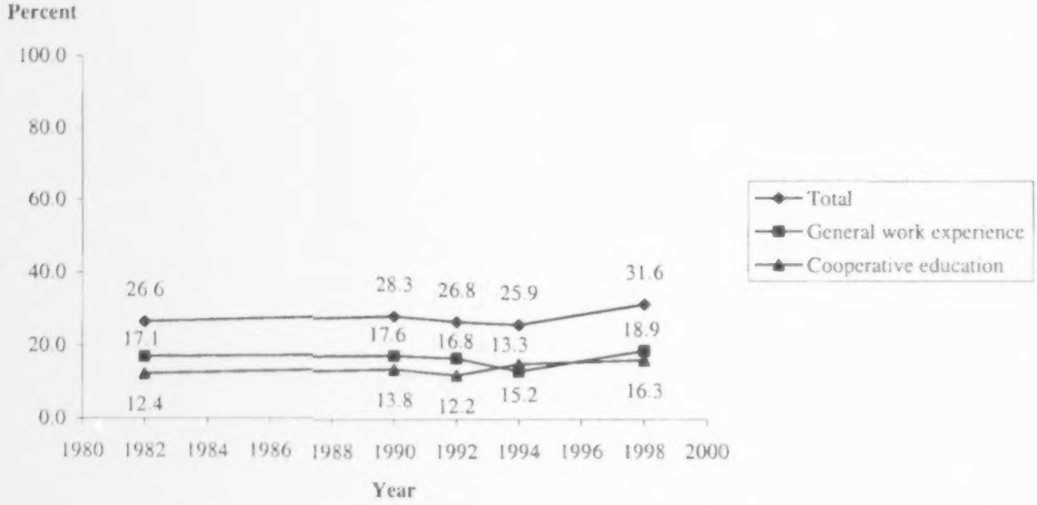
[40] Differences between general work experience and cooperative education were discussed by experts during both the creation and revision of the Secondary School Taxonomy (SST) and are reflected in the current SST (Bradby and Hoachlander 1999). See also Westat (1992).

[41] In addition, as of 1997, cooperative education was one of the two most common forms of work-based learning in high schools, along with job shadowing (Levesque et al. 2000).

[42] Percentages sum to greater than the total for work-based learning because some students may have participated in both general work experience and cooperative education courses.

Figure 29. Percentage of public high school graduates taking work-based learning, by type of course: Various years, 1982–98



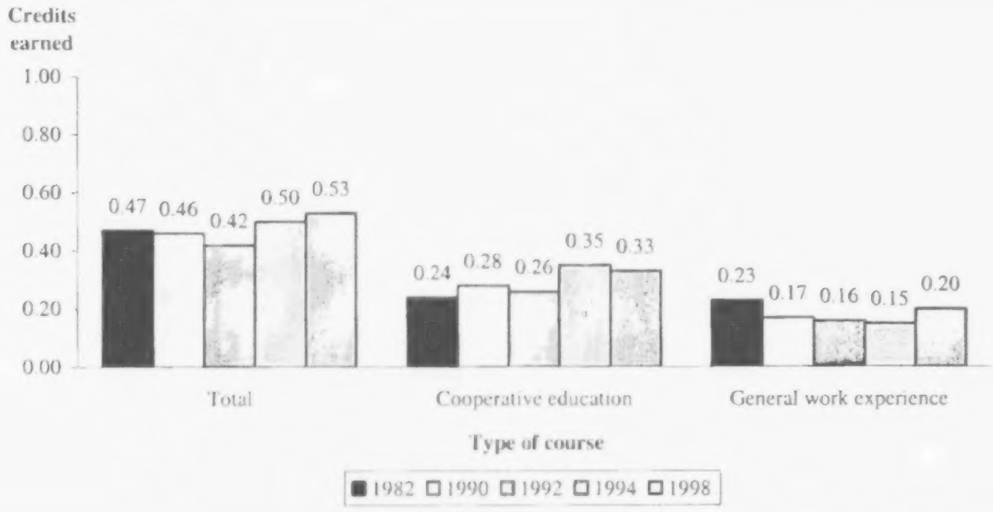
NOTE: Details may sum to greater than the totals because some graduates took both general work experience and cooperative education courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

work-based learning courses in high school (figure 30), an amount that was not significantly different from the average number of credits that they earned in family and consumer sciences education (0.51 credits) (figure 9). However, graduates earned more credits on average in cooperative education (0.33 credits) than in general work experience courses (0.20 credits). For the class of 1998, this translates into cooperative education participants taking the equivalent of about two full-year cooperative education courses on average, in comparison with general work experience participants taking the equivalent of about one full-year general work experience course on average.

Over the period studied, participation in work-based learning, overall, remained relatively steady. Although the percentage of public high school graduates taking any work-based learning appeared to increase from 26.6 percent for 1982 graduates to 31.6 percent for 1998 graduates, this difference was not statistically significant (figure 29). Similarly, no difference was detected in the number of credits that 1982 and 1998 graduates earned on average in work-based learning in high school (0.47 credits and 0.53 credits, respectively) (figure 30).

Figure 30. **Average number of credits earned in work-based learning by public high school graduates, by type of course: Various years, 1982–98**



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

No significant differences between 1982 and 1998 public high school graduates were detected either in the percentage of graduates earning general work experience credits (17.1 percent versus 18.9 percent) (figure 29), or in the average number of credits that graduates earned in general work experience courses (0.23 credits versus 0.20 credits) (figure 30). However, the percentage of public high school graduates taking cooperative education courses increased from 12.4 percent for 1982 graduates to 16.3 percent for 1998 graduates (figure 29). The average number of credits that graduates earned in cooperative education also appeared to increase over the period, but this difference was not statistically significant (figure 30).

Because participation in cooperative education increased while overall occupational coursetaking held steady, cooperative education represented a growing share of all occupational coursetaking over the period studied. Comparing the classes of 1982 and 1998, the percentage of total occupational credits earned by public high school graduates that were cooperative education credits increased slightly from 6.3 percent to 8.5 percent (table A15).

Vocational/Technical Coursetaking and State High School Graduation Requirements

This section examines the relationship between changes in vocational/technical coursetaking and changes in state high school graduation requirements. Because of limitations in the data, the analysis was restricted to changes between 1990 and 1998.[43]

As previously discussed, although vocational/technical coursetaking declined between 1982 and 1998, it remained relatively steady during the 1990s. Specifically, 98.0 percent of 1990 graduates and 96.5 percent of 1998 graduates took at least one vocational/technical course in high school (figure 5 and table A1).[44] There was also no significant difference between 1990 and 1998 graduates in the numbers of credits they earned on average in vocational/technical education in high school (4.19 credits and 3.99 credits, respectively) (figure 6).[45] However, vocational/technical coursetaking may have varied during this decade among the 50 states, possibly associated with changes in state high school graduation requirements. Between 1990 and 1998, 12 states increased their total high school graduation requirements (table 1a), and 10 additional states met the National Commission on Excellence in Education's core academic recommendations advocated in *A Nation at Risk*[46] (table 1b). During the same period, 10 states increased and 8 states decreased their vocational/technical credit requirements for graduation.[47] These different changes in state requirements could have contributed to state-level differences in participation in vocational/technical education during the 1990s.

To examine this issue, this section of the report examines trends in vocational/technical coursetaking among states that did and did not change their high school graduation requirements between 1990 and 1998. Specifically, this section asks: Were increases in total graduation requirements, academic requirements, and other nonvocational/nontechnical requirements associated with decreased vocational/technical coursetaking? Were increases in vocational/technical credit requirements associated with increased vocational/technical coursetaking? Table 10 summarizes state high school graduation requirements and the number of states that exhibited various changes in these requirements between 1990 and 1998. The graduation requirement measures are defined as follows:

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[43] It was not possible to link student transcripts to states in the High School and Beyond data set, which provided information on 1982 high school graduates for this report, and national data on state graduation requirements were not available for 1992 and 1994.

[44] The small apparent decline between 1990 and 1998 was not statistically significant.

[45] Although the average number of vocational/technical credits that graduates earned in 1990 appeared to decline by 1992 and then hold steady thereafter, the small apparent declines between 1990 and 1992 and between 1990 and 1998 were not statistically significant.

[46] The Commission's core academic recommendations included 4 years of English and 3 years each of mathematics, science, and social studies. See the National Commission on Excellence in Education (1983).

[47] See Education Commission of the States (1990) and Snyder and Hoffman (2001), table 154.

Table 10. Number of the 50 states with specified changes in state high school graduation requirements between 1990 and 1998

	Number of states
Total	50
Change in vocational/technical requirements[1]	
Increase	10
No change	25
Decrease	8
Not applicable	7
Change in specific nonvocational/technical, nonelective requirements[2]	
Increase	18
No increase (no change or decrease)	25
Not applicable	7
Change in total nonvocational/technical requirements[3]	
Increase	17
No increase (no change or decrease)	26
Not applicable	7
Change in total graduation requirements	
Increase of 2 or more credits	6
Increase of less than 2 credits	6
No increase (no change or decrease)	32
Not applicable	6
Change in New Basics core academic requirements[4]	
Met in 1998 only	11
Met in both years	2
Not met in 1998	30
Not applicable	7

[1] Includes career education (including guidance), practical arts, computer education, free enterprise, vocational education, technology and consumer requirements. Does not include home/personal management or life skills requirements.

[2] Includes all nonvocational/technical requirements except for unspecified elective requirements.

[3] Includes all nonvocational/technical requirements, such as English/language arts, social studies, mathematics, science, physical education/health, fine arts, foreign languages, humanities, oral communication or speech, home/personal management, life skills, and unspecified elective requirements.

[4] Includes 4 years of English and 3 years each of mathematics, science, and social studies.

NOTE: In cases where students could choose how to meet a credit requirement, the requirement was split evenly among the optional subjects. For example, where students could earn 1.0 credit of vocational education and/or fine arts, 0.5 credits were assigned to both subjects for analysis purposes. "Not applicable" means that states allowed local school districts to set their own high school graduation requirements.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

Vocational/technical requirements—Include credit requirements in career education (including guidance), industrial arts, home economics, practical arts, computer literacy or education, keyboarding, free enterprise, vocational education, technology, and consumer education requirements. When students could choose how to meet a credit requirement, the requirement was split evenly among the optional subjects. For example, when students could earn 1.0 credit of vocational education and/or fine arts, one-half credit was assigned to both subjects for analysis purposes.

Specific nonvocational/nontechnical requirements—Include all nonvocational/nontechnical requirements, *except* unspecified elective requirements. For example, a state may require 2.0 credits of electives, a requirement that could be met by taking vocational/technical or other courses. These unspecified electives are not included; instead, this measure includes all specific nonvocational/nontechnical requirements, such as credit requirements in English, social studies, mathematics, science, physical education/health, fine arts, foreign languages, humanities, oral communication or speech, and life skills requirements.

Total nonvocational/nontechnical requirements—Include all nonvocational/nontechnical requirements, such as credit requirements in English, social studies, mathematics, science, physical education/health, fine arts, foreign languages, humanities, oral communication or speech, life skills requirements, and unspecified electives.

Total graduation requirements—Include all credit requirements for high school graduation.

New Basics core academic requirements—Include 4 years of English and 3 years each of mathematics, science, and social studies.

On the one hand, vocational/technical coursetaking may be expected to increase in states increasing their vocational/technical requirements or, alternatively, decline in states decreasing such requirements. On the other hand, vocational/technical coursetaking may be expected to decrease in states that increased other types of graduation requirements, as defined by the last four measures listed above. In particular, vocational/technical coursetaking may be expected to decrease in states increasing their specific nonvocational/nontechnical requirements and core academic requirements, because increases in these courses might crowd out vocational/technical coursetaking. Factors other than state graduation requirements may also contribute to coursetaking changes.

With several notable exceptions, changes in graduation requirements examined in this report were not related to coursetaking patterns, possibly due to the relatively small number of students in some graduation-requirement categories. However, there was some evidence that, in states that increased their total graduation requirements and/or their total nonvocational/nontechnical requirements, students decreased their vocational/technical coursetaking. Specifically, graduates in states that increased their total high school graduation requirements by 2.0 or more credits between 1990 and 1998 earned on average 1.00 fewer vocational/technical credits in high school—equivalent to one less full-year vocational/technical course—by the end of the period (table 11). Specifically, graduates in these states earned 0.62 fewer occupational credits and 0.23 fewer family and consumer sciences education credits between the 2 years. Similarly, graduates in states that increased their total high school graduation requirements by 2 or more credits between 1990 and 1998 were less likely by the end of the period to invest 3.0 or more credits in vocational/technical education, invest 3.0 or more credits in occupational education, and concentrate in occupational education (earn 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) (with decreases of 13.8 percentage points, 12.1 percentage points, and 9.6 percentage points, respectively) (table 12). In contrast, students in states that increased their total high school graduation requirements by fewer than 2.0 credits, that did not increase these requirements, or that did not have applicable state requirements did not exhibit statistically significant decreases on any of these vocational/technical coursetaking measures.

In addition, graduates in states that increased their total nonvocational/nontechnical requirements for graduation between 1990 and 1998 earned on average 0.50 fewer vocational/technical credits in high school—equivalent to one less half-year vocational/technical course—by the end of the period (table 11). Graduates in these states were also less likely by the end of the period to invest 3.0 or more credits in vocational/technical education and concentrate in occupational education (earn 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) (with decreases of 7.7 percentage points and 6.5 percentage points, respectively) (table 12).[48]

In contrast, students in states that exhibited no increase (either no change or a decrease) in high school graduation requirements sometimes increased their vocational/technical coursetaking. Specifically, graduates in states that had no increase in their total high school graduation requirements between 1990 and 1998 were more likely by the end of the period to invest 3.0 or more credits in occupational education in high school (an increase of 6.0 percentage points) (table 12). Similarly, graduates in states that had no increase in their total nonvocational/nontechnical requirements between 1990 and 1998 were more likely by the end of the period to invest 3.0 or more credits in occupational education (an increase of 5.5 percentage points).

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[48] Although graduates in states that increased their total nonvocational/nontechnical requirements for graduation between 1990 and 1998 also appeared to be less likely over the period to invest 3.0 or more credits in occupational education, this difference was not statistically significant.

Table 11. Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998

	Vocational/technical total			General labor market preparation			Family and consumer sciences education			Occupational education		
	1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Total	4.19	3.99	-0.20	0.73	0.61	-0.12*	0.57	0.51	-0.06	2.89	2.87	-0.02
Change in vocational/technical requirements[1]												
Increase	4.28	4.27	-0.01	0.72	0.68	-0.04	0.65	0.59	-0.06	2.90	3.00	0.10
No change	3.78	4.07	0.29	0.75	0.68	-0.07	0.70	0.70	‡	2.34	2.69	0.35
Decrease	4.09	3.81	-0.28	0.71	0.59	-0.12*	0.53	0.45	-0.08	2.85	2.78	-0.07
Not applicable	4.55	4.16	-0.39	0.81	0.49	-0.32*	0.55	0.47	-0.08	3.19	3.20	0.01
Change in specific nonvocational/technical, nonelective requirements[2]												
Increase	4.33	4.29	-0.04	0.75	0.62	-0.13*	0.65	0.55	-0.10	2.93	3.12	0.19
No increase	3.99	3.77	-0.22	0.70	0.62	-0.08	0.53	0.49	-0.04	2.77	2.65	-0.12
Not applicable	4.55	4.16	-0.39	0.81	0.49	-0.32*	0.55	0.47	-0.08	3.19	3.20	0.01
Change in total nonvocational/technical requirements[3]												
Increase	4.25	3.75	-0.50*	0.72	0.59	-0.13*	0.57	0.46	-0.11	2.96	2.70	-0.26
No increase	4.03	4.09	0.06	0.72	0.64	-0.08	0.58	0.54	-0.04	2.73	2.90	0.17
Not applicable	4.55	4.16	-0.39	0.81	0.49	-0.32*	0.55	0.47	-0.08	3.19	3.20	0.01
Change in total graduation requirements												
Increase of 2 or more credits	4.06	3.06	-1.00*	0.73	0.59	-0.14	0.47	0.24	-0.23*	2.85	2.23	-0.62*
Increase of less than 2 credits	4.51	4.14	-0.37	0.71	0.51	-0.20*	0.62	0.54	-0.08	3.18	3.09	-0.09
No increase	3.98	4.09	0.11	0.72	0.66	-0.06	0.58	0.56	-0.02	2.68	2.87	0.19
Not applicable	4.55	4.16	-0.39	0.81	0.49	-0.32*	0.55	0.47	-0.08	3.19	3.20	0.01

See notes at end of table.

Table 11. Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998—Continued

	Vocational/technical total			General labor market preparation			Family and consumer sciences education			Occupational education		
	1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements[4]												
Met in 1998 only	4.68	4.45	-0.23	0.82	0.68	-0.14	0.69	0.55	-0.14	3.17	3.21	0.04
Met in both years	4.42	4.50	0.08	0.90	0.58	-0.32*	0.66	0.55	-0.11	2.86	3.36	0.50
Not met in 1998	3.95	3.76	-0.19	0.67	0.61	-0.06*	0.54	0.50	-0.04	2.74	2.65	-0.09
Not applicable	4.55	4.16	-0.39	0.81	0.49	-0.32*	0.55	0.47	-0.08	3.19	3.20	0.01

‡Reporting standards not met. (Too few cases.)

*These changes were statistically significant; all other changes were not statistically significant.

[1] Includes career education (including guidance), industrial arts, home economics, practical arts, computer literacy or education, keyboarding, free enterprise, vocational education, technology, and consumer education requirements.

[2] Includes all nonvocational/technical requirements except for unspecified elective requirements.

[3] Includes all nonvocational/technical requirements, such as English/language arts, social studies, mathematics, science, physical education/health, fine arts, foreign languages, humanities, oral communication or speech, life skills, and unspecified elective requirements.

[4] Include 4 years of English and 3 years each of mathematics, science, and social studies.

NOTE: In cases where students could choose how to meet a credit requirement, the requirement was split evenly among the optional subjects. For example, where students could earn 1.0 credit of vocational education and/or fine arts, 0.5 credits were assigned to both subjects for analysis purposes. "Not applicable" means that states allowed local school districts to set their own high school graduation requirements. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

Table 12. Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998

	Occupational concentrators[1]			Occupational investors[2]			Vocational/technical investors[3]		
	1990	1998	Change	1990	1998	Change	1990	1998	Change
Total	27.8	25.0	-2.8*	43.0	43.8	0.9	63.7	61.5	-2.2
Change in vocational/technical requirements[4]									
Increase	28.1	25.0	-3.1	43.6	47.0	3.4	66.1	66.4	0.3
No change	20.6	20.5	-0.1	34.8	41.5	6.7	62.2	65.1	2.8
Decrease	27.8	24.8	-3.1	41.7	41.8	0.1	61.0	58.0	-3.0
Not applicable	29.5	29.6	0.1	49.1	48.7	-0.5	69.7	64.6	-5.1
Change in specific nonvocational/technical, nonelective requirements[5]									
Increase	31.2	29.0	-2.2	44.7	50.1	5.4	66.3	67.4	1.1
No increase	25.1	21.6	-3.5	39.9	39.0	-0.9	60.1	57.3	-2.9
Not applicable	29.5	29.6	0.1	49.1	48.7	-0.5	69.7	64.6	-5.1
Change in total nonvocational/technical requirements[6]									
Increase	30.9	24.4	-6.5*	45.2	40.3	-4.9	65.3	57.6	-7.7*
No increase	24.9	24.4	-0.5	39.3	44.8	5.5*	60.5	63.0	2.5
Not applicable	29.5	29.6	0.1	49.1	48.7	-0.5	69.7	64.6	-5.1
Change in total graduation requirements									
Increase of 2 or more credits	30.3	20.6	-9.6*	44.0	31.8	-12.1*	61.4	47.5	-13.8*
Increase of less than 2 credits	33.8	28.7	-5.1	48.6	46.2	-2.4	69.0	62.3	-6.7
No increase	24.2	24.0	-0.2	38.5	44.6	6.0*	60.1	63.3	3.2
Not applicable	29.5	29.6	0.1	49.1	48.7	-0.5	69.7	64.6	-5.1

See notes at end of table.

Table 12. Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998—Continued

	Occupational concentrators[1]			Occupational investors[2]			Vocational/technical investors[3]		
	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements[7]									
Met in 1998 only	35.3	30.4	-4.9	49.5	53.4	3.9	71.3	71.4	0.2
Met in both years	26.1	33.1	7.1	41.4	47.4	6.0	65.9	65.7	-0.2
Not met in 1998	25.5	21.5	-4.0*	39.8	39.5	-0.3	59.9	57.3	-2.7
Not applicable	29.5	29.6	0.1	49.1	48.7	-0.5	69.7	64.6	-5.1

*These changes were statistically significant; all other changes were not statistically significant.

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, public and protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] Graduates earning 3.0 or more credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Includes career education (including guidance), industrial arts, home economics, practical arts, computer literacy or education, keyboarding, free enterprise, vocational education, technology, and consumer education requirements.

[5] Includes all nonvocational/technical requirements except for unspecified elective requirements.

[6] Includes all nonvocational/technical requirements, such as English/language arts, social studies, mathematics, science, physical education/health, fine arts, foreign languages, humanities, oral communication or speech, life skills, and unspecified elective requirements.

[7] Includes 4 years of English and 3 years each of mathematics, science, and social studies.

NOTE: In cases where students could choose how to meet a credit requirement, the requirement was split evenly among the optional subjects. For example, where students could earn 1.0 credit of vocational education and/or fine arts, 0.5 credits were assigned to both subjects for analysis purposes. "Not applicable" means that states allowed local school districts to set their own high school graduation requirements. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

While 1998 public high school graduates earned on average fewer general labor market preparation credits than their 1990 counterparts, there were generally no significant declines in the amounts of general labor market preparation coursework that graduates took in states that exhibited no increase (either no change or a decrease) in graduation requirements over the period. Specifically, there were no significant declines in general labor market preparation credits earned by 1990 and 1998 graduates in states that had no increase in their total high school graduation requirements, no increase in total nonvocational/nontechnical requirements, no increase in specific nonvocational/nontechnical requirements, and no change in vocational/technical requirements between 1990 and 1998 (table 11). Generally, declines in general labor market preparation coursetaking were restricted to states with increasing graduation requirements or states that allowed local school districts to set their own high school graduation requirements (termed "not applicable" in table 11).[49]

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[49] Exceptions to this general pattern include the following. Graduates in states that met the New Basics core academic requirements in both 1990 and 1998 earned fewer general labor market preparation credits over the period. In addition, graduates in states that increased their vocational/technical requirements between 1990 and 1998, increased their total graduation requirements by 2.0 or more credits over the period, and changed to meet the New Basics core academic standards in 1998 all earned similar numbers of general labor market preparation credits in 1990 and 1998.

III. Trends in Introductory Technology and Computer-Related Coursetaking

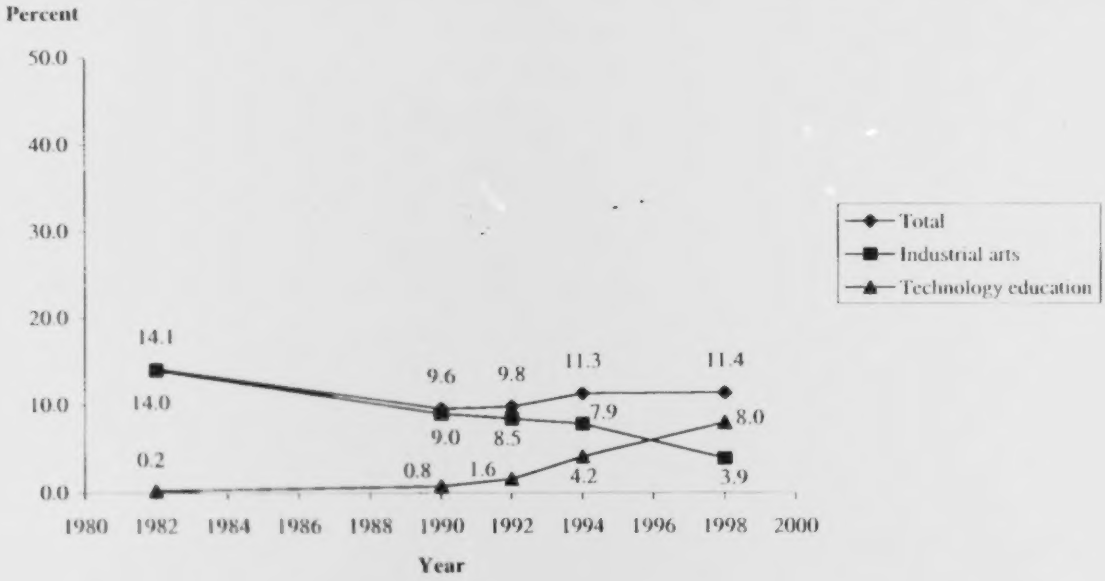
Many high school courses incorporate the use of technology. Students use the Internet to conduct research and use computers to type and design reports. Students also use various technologies in the vocational/technical curriculum, including computerized and other "high-technology" production techniques in agriculture, instrumentation in health care, and machinery in trade and industrial program areas. However, it is not usually possible to determine from transcript records what kinds of specific technology and equipment are being used in a course. Consequently, this chapter focuses on courses whose *primary objective* is to teach students particular technologies or technology principles in general. It is not possible to determine how technology was used in these courses, nor is the intent here to imply that technology-related learning only takes place in these courses. With that caveat, this chapter examines two main technology-related areas: introductory technology and computer-related coursetaking. These two curricular areas are defined and discussed below.

Trends in Introductory Technology Coursetaking

Within the vocational/technical curriculum, general labor market preparation consists of basic typewriting/keyboarding, career preparation/general work experience, and technology education/industrial arts courses. In this section, technology education and industrial arts courses are referred to collectively as "introductory technology" courses. The 1998 public high school graduates earned 0.12 credits on average in these introductory technology courses in high school, which constituted about 20 percent of the 0.61 general labor market preparation credits they earned (figure 10 and table A3). These 0.12 credits are the equivalent of about one in four graduates taking a half-year technology education/industrial arts course in high school.

No significant difference was detected in the percentages of 1982 and 1998 public high school graduates who took introductory technology coursework in high school (14.1 percent and 11.4 percent, respectively) (figure 31). In contrast, the amount of introductory technology coursework that graduates took declined over the period, although—in keeping with the overall declines in vocational/technical coursetaking cited in chapter II—most of this decline had occurred by 1990. The average number of credits that graduates earned in introductory technology

Figure 31. Percentage of public high school graduates taking introductory technology courses, by area: Various years, 1982–98



NOTE: Details may sum to greater than the totals because some graduates took both industrial arts and technology education courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

courses declined from 0.17 credits for 1982 graduates to 0.11 credits for 1990 graduates (figure 32). As of 1998, graduates earned 0.12 introductory technology credits on average in high school.[50]

The Shift From Industrial Arts to Technology Education

Industrial arts grew out of the manual training movement in the late 1800s and rested on the belief that all students—at least, all male students—should learn to work with their hands as well as their minds (Gallinelli 1979). During much of the 20th century, industrial arts courses served to introduce students to the equipment and practices of mechanized industry. During the 1980s and 1990s, many schools began replacing industrial arts with technology education, which

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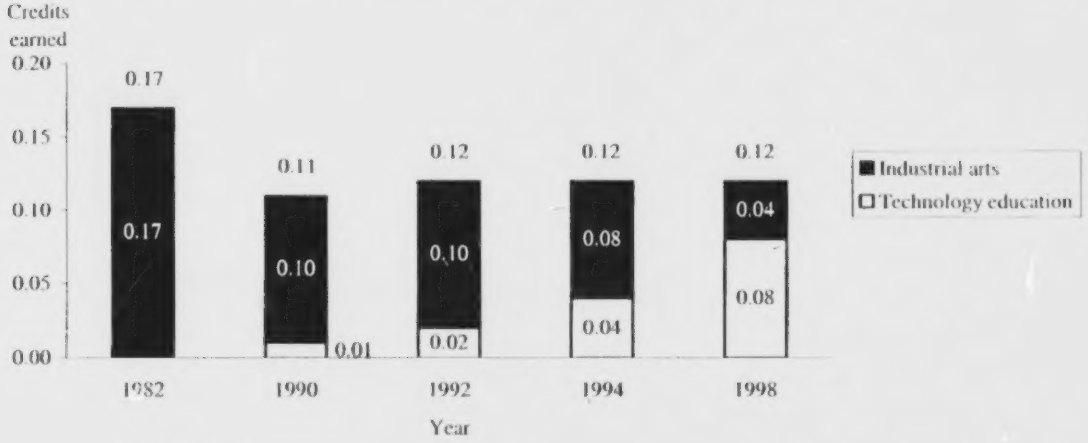
[50] The difference in introductory technology credits earned by 1990 and 1998 graduates was not statistically significant.

Figure 32. Average number of credits earned in introductory technology courses by public high school graduates, by area: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

emphasizes introducing students to the "high technology" of the information age.[51] While some technology education courses are intended as an introduction to technology for all students, others are configured as pre-engineering courses for a more select group of students. It is not usually possible to determine from transcript records the particular orientation of the technology education courses that students took during the period studied.[52]

Previous research showed that between 1982 and 1994, industrial arts coursetaking declined while technology education coursetaking increased (Levesque et al. 2000). Specifically, the percentage of public high school graduates who took industrial arts courses declined by 6.1 percentage points, from 14.0 percent for 1982 graduates to 7.9 percent for 1994 graduates (figure 31). In addition, the average number of credits that graduates earned in industrial arts declined by about half, from 0.17 credits for the class of 1982 to 0.08 credits for the class of 1994 (figure 32). In contrast, the percentage of public high school graduates who took technology education courses increased by 4.0 percentage points, from 0.2 percent for 1982 graduates to 4.2 percent for

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[51] The International Technology Education Association (ITEA) defines technology education as "problem-based learning utilizing math, science, and technology principles" (see *http://www.itea.org*).

[52] However, the Center for Occupational Research and Development's Principles of Technology course is included under physics rather than under technology education in the taxonomy used for this report, because the course is configured as an applied physics course (Bradby and Hoachlander 1999).

1994 graduates (figure 31). The average number of credits that graduates earned in technology education also increased, from virtually no credits (0.00 credits) for the class of 1982 to 0.04 credits for the class of 1994 (figure 32).

The 4 years between 1994 and 1998 followed earlier trends, with industrial arts coursetaking continuing to decline and technology education coursetaking continuing to increase. In fact, between 1994 and 1998, industrial arts and technology education were almost perfect substitutes. Between the 2 years, the percentage of public high school graduates taking industrial arts courses declined by 3.9 percentage points, while the percentage of graduates taking technology education increased by 3.9 percentage points (figure 31). Similarly, between 1994 and 1998, the average number of credits that public high school graduates earned in industrial arts in high school declined by 0.04 credits, while the average number earned in technology education increased by 0.04 credits (figure 32). In 1998, about twice as many graduates took courses in technology education as took courses in industrial arts (8.0 percent versus 3.9 percent) (figure 31), and graduates earned about twice as many credits in technology education as in industrial arts (0.08 credits versus 0.04 credits) (figure 32). However, it is not possible to determine from the available data to what extent the shift from industrial arts to technology education reflected real changes in course content and methodology or a relabeling of industrial arts courses.

Trends in Computer-Related Coursetaking

Classification of Computer-Related Courses

The standard NCES procedures for transcript studies currently include all computer-related courses under the vocational/technical curriculum (Alt and Bradby 1999). Although some of these courses are included in general labor market preparation (under basic typewriting/keyboarding and under technology education), most computer-related courses are included in occupational education. Most of these courses are included under the business services and computer technology program areas, while some are included under the agriculture, business management, and drafting/graphics program areas. Figure 33 summarizes the location of all computer-related courses in the Secondary School Taxonomy (SST). Only a subset of courses in technology education, agriculture, business management, business services, and drafting/graphics areas were classified as computer related.[53] In contrast, virtually all courses in basic typewriting/keyboarding and computer technology were so classified.

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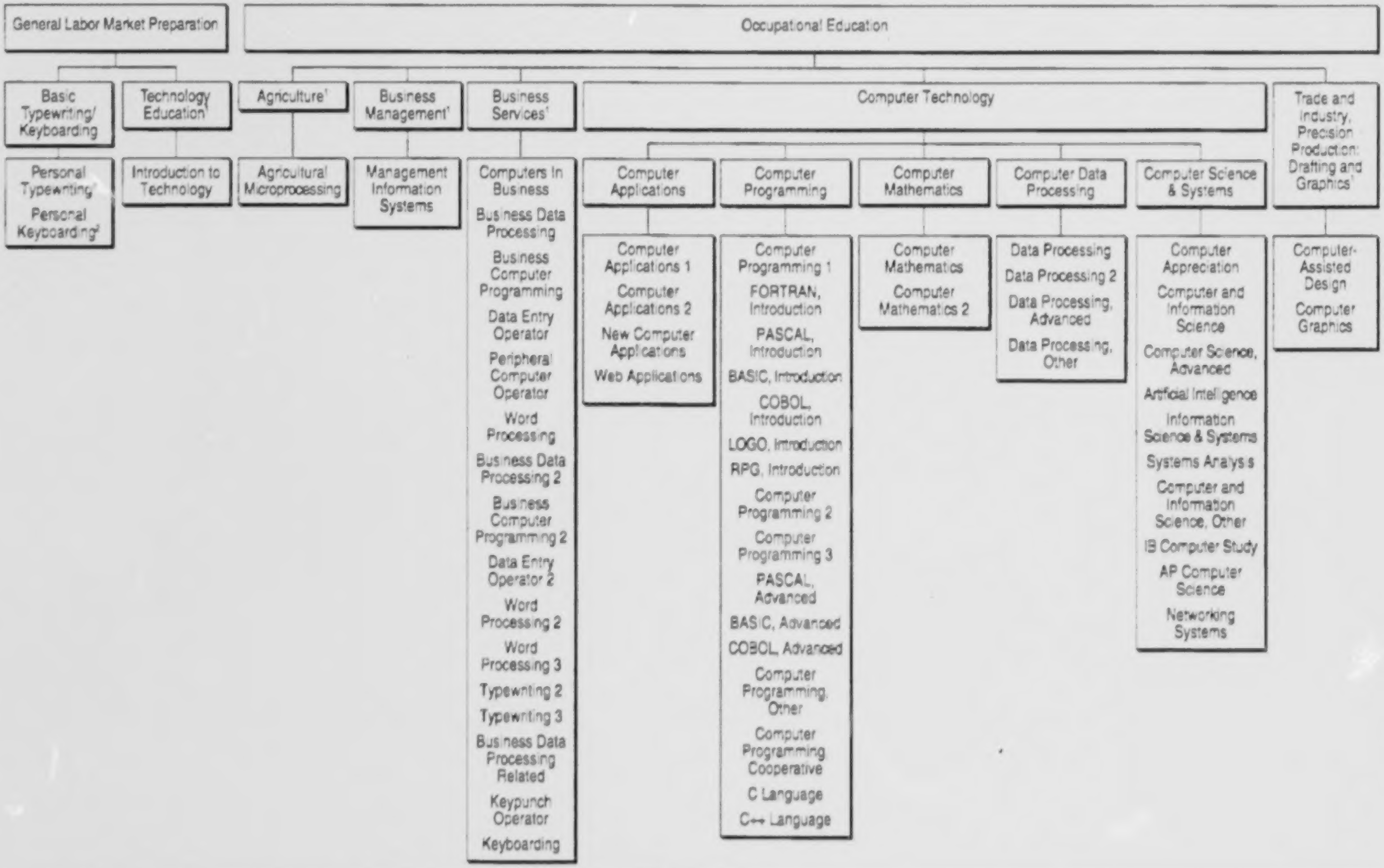
[53] In all years studied, there was no detectable computer-related coursetaking in agriculture and business management. Therefore, these program areas are dropped from the rest of the discussion.

Figure 33. Classification of computer-related courses in the Secondary School Taxonomy


General Labor Market Preparation
Occupational Education
Basic Typewriting/ Keyboarding
Technology Education[1]
Agriculture[1]
Business Management[1]
Business Services[1]
Computer Technology
Trade and Industry, Precision Production: Drafting and Graphics[1]
Personal Typewriting[2]
Personal Keyboarding[2]
Introduction to Technology
Agricultural Microprocessing
Management Information Systems
Computers In Business
Business Data Processing
Business Computer Programming
Data Entry Operator
Peripheral Computer Operator
Word Processing
Business Data Processing 2
Business Computer Programming 2
Data Entry Operator 2
Word Processing 2
Word Processing 3
Typewriting 2
Typewriting 3
Business Data Processing Related
Keypunch Operator
Keyboarding
Computer Applications
Computer Applications 1
Computer Applications 2
New Computer Applications
Web Applications
Computer Programming
Computer Programming 1
FORTRAN, Introduction
PASCAL, Introduction
BASIC, Introduction
COBOL, Introduction
LOGO, Introduction
RPG, Introduction
Computer Programming 2
Computer Programming 3
PASCAL, Advanced
BASIC, Advanced
COBOL, Advanced
Computer Programming, Other
Computer Programming Cooperative
C Language
C++ Language
Computer Mathematics
Computer Mathematics
Computer Mathematics 2
Computer Data Processing
Data Processing
Data Processing 2
Data Processing, Advanced
Data Processing, Other
Computer Science & Systems
Computer Appreciation
Computer and Information Science
Computer Science, Advanced
Artificial Intelligence
Information Science & Systems
Systems Analysis
Computer and Information Science, Other
IB Computer Study
AP Computer Science
Networking Systems
Computer-Assisted Design
Computer Graphics

[1] Only a subset of courses in these areas were considered computer related.

[2] According to expert recommendation, these courses were not counted as computer related in 1982. In contrast, they were assumed to be computer related in 1990 and subsequent years.

SOURCE: Adapted from Bradby, D. and Hoachlander, E.G. (1999). *1998 Revision of the Secondary School Taxonomy* (NCES 1999–06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

Although virtually all basic typewriting/keyboarding and computer technology courses were classified as computer related, there was one main exception to this rule. According to recommendations made by experts during revision of the SST, all basic typewriting/keyboarding courses in 1982 were assumed *not* to be computer related (Alt and Bradby 1999). In contrast, in 1990 and subsequent years, all of these courses were classified as computer related. These courses were classified in this way because it is not usually possible to determine from transcript records what kind of equipment—whether a standard electric typewriter, an electric typewriter with computerized memory, or a computer—was used in a basic typewriting/keyboarding course. This decision may have resulted in an undercount of computer-related coursetaking in 1982 and an overcount in the 1990s, particularly in the early 1990s. The magnitude of these potential miscounts is not known. Because of the difficulty of determining the computer-related nature of basic typewriting/keyboarding courses, discussion of trends in overall computer-related coursetaking in this report focuses on the years 1990 to 1998. In contrast, to describe trends in computer-related occupational coursetaking and in computer technology coursetaking, the report covers the entire period from 1982 to 1998.

It also was decided during the 1998 revision of the SST to categorize all computer-related courses according to content rather than pedagogy. This revision involved shifting six courses that had previously been categorized under applied mathematics to the computer technology program area within occupational education.[54] Consequently, all computer-related courses taught in mathematics departments or computer education departments are currently included under the computer technology program area, which encompasses courses in five subareas: computer applications, computer data processing, computer programming, computer science and systems, and computer mathematics (figure 33).[55] This revision was applied to all years in the analysis.

Overall trends in the computer technology program area were discussed in the context of trends in all occupational program areas in chapter II. In contrast, this chapter discusses trends in computer technology within the context of all computer-related coursetaking—of which computer technology coursetaking is only a part. In addition, this chapter examines trends in the subareas within computer technology.

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[54] The six courses included Introduction to Computers, Computer Mathematics 1 and 2, Other Information Sciences and Systems, Other Systems Analysis, and Other Computer and Information Sciences (Bradby and Hoachlander 1999, p. 29).

[55] One consequence of this decision is that the courses classified under computer technology may not constitute planned sequences of courses to the same extent that courses in other occupational program areas do. In particular, computer technology students may be less likely than those in other occupational areas to complete three or more courses in computer technology (the standard that many states use to identify vocational/technical completers). In addition, computer technology teachers may be less likely to arrange cooperative education experiences, so that students taking computer technology courses may be less likely to participate in cooperative education as part of that coursework.

An Overview of Computer-Related Coursetaking in 1998

The 1998 public high school graduates earned on average 1.05 credits in computer-related courses in high school—equivalent to about one full-year computer-related course (figure 34 and table A16). Most of these credits (0.70 credits) were earned in the occupational curriculum, while the rest (0.35 credits) were earned in general labor market preparation. Within the general labor market curriculum, 1998 public high school graduates earned more credits in basic typewriting/keyboarding courses than in technology education (0.29 credits versus 0.06 credits). Within the occupational curriculum, 1998 public high school graduates earned more computer-related credits on average in the business services and the computer technology program areas (0.33 credits and 0.31 credits, respectively) than in computer-related drafting/graphics courses (0.06 credits).[56] The largest proportions of computer-related credits earned in high school by 1998 graduates were in basic typewriting/keyboarding (33.5 percent), business services (30.5 percent), and computer technology (27.2 percent) (figure 35 and table A17).[57]

Within the computer technology program area, 1998 graduates earned more credits on average in computer applications courses than in any other area. Specifically, 1998 public high school graduates earned 0.16 credits in computer applications courses, compared with 0.09 credits in computer science and systems, 0.04 credits in computer programming, and 0.01 credits each in data processing and computer mathematics (figure 34 and table A16).

Trends in Overall Computer-Related Coursetaking

During the 1990s, overall computer-related coursetaking was relatively stable. Specifically, no significant change was detected in the average credits earned by 1990 and 1998 public high school graduates in computer-related courses in high school (1.03 credits and 1.05 credits, respectively) (figure 36 and table A16). Throughout the 1990s, computer-related coursetaking represented at least 4 percent of the total number of credits that public high school graduates earned in high school (table 13).

Computer-related coursetaking within the occupational curriculum was also relatively stable. There was no significant difference between the 1990 and 1998 graduates in the average number of computer-related credits they earned in occupational education in high school (figure 36 and table A16).[58] Computer-related occupational coursetaking represented between 31 and 35 percent of total occupational coursetaking during this same period (figure 37 and table A18).[59]

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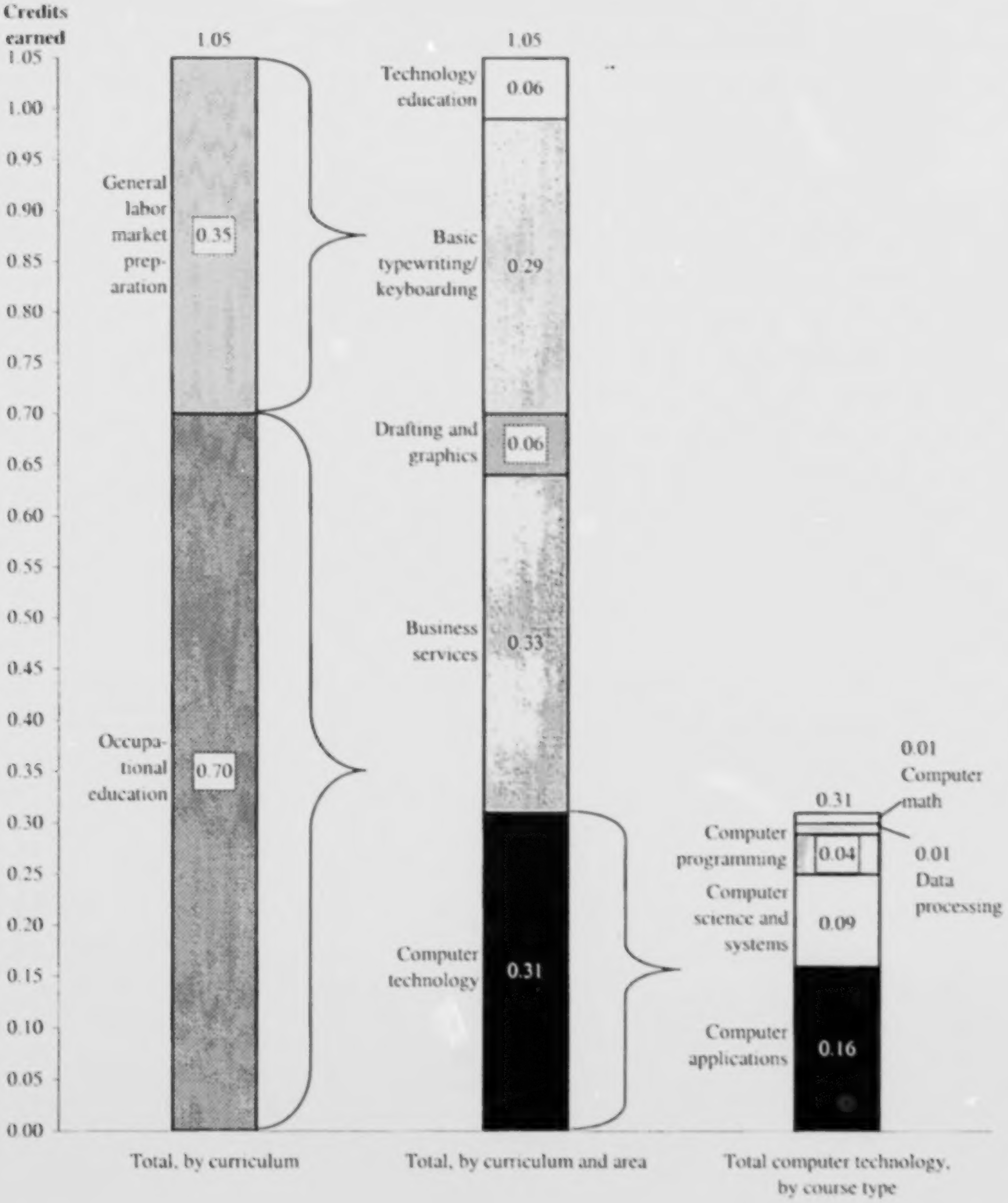
[56] The slight difference between business services and computer technology was not statistically significant.

[57] There were no statistically significant differences among these three computer-related areas.

[58] Although the increase between 1990 and 1992 was statistically significant, the difference between 1990 and 1998 was not.

[59] Again, although the increase between 1990 and 1992 was statistically significant, the difference between 1990 and 1998 was not.

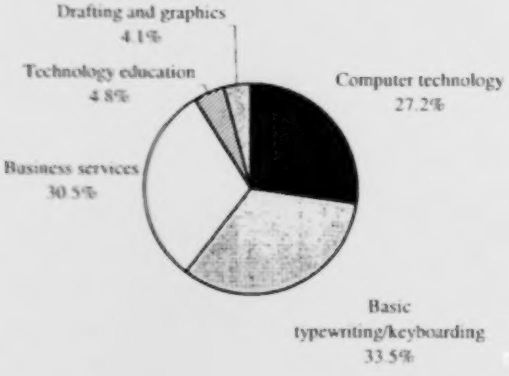
Figure 34. Average number of computer-related credits earned by public high school graduates, by vocational/technical area: 1998



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

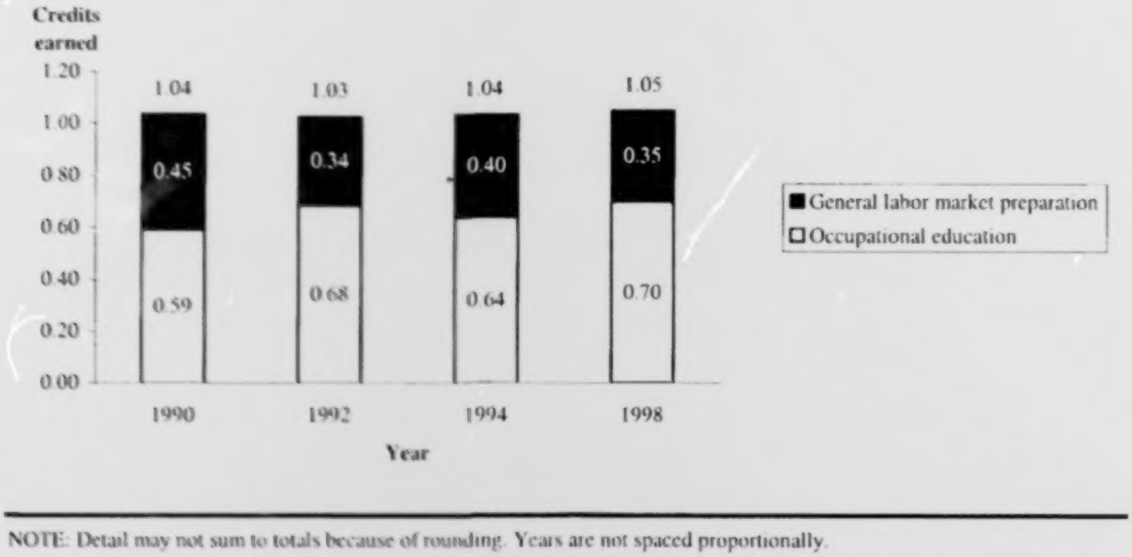
Figure 35. Percentage distribution of computer-related credits earned by public high school graduates, by computer-related area: 1998



NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Figure 36. Average number of computer-related credits earned by public high school graduates, by general labor market preparation and occupational education curricula: Various years, 1990–98



NOTE: Detail may not sum to totals because of rounding. Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table 13. Percentage distribution of total credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98

	1982[1]	1990	1992	1994	1998
Total	†	100.0	100.0	100.0	100.0
Noncomputer-related	†	95.6	95.7	95.7	95.8
Computer-related, total	†	4.4	4.3	4.3	4.2

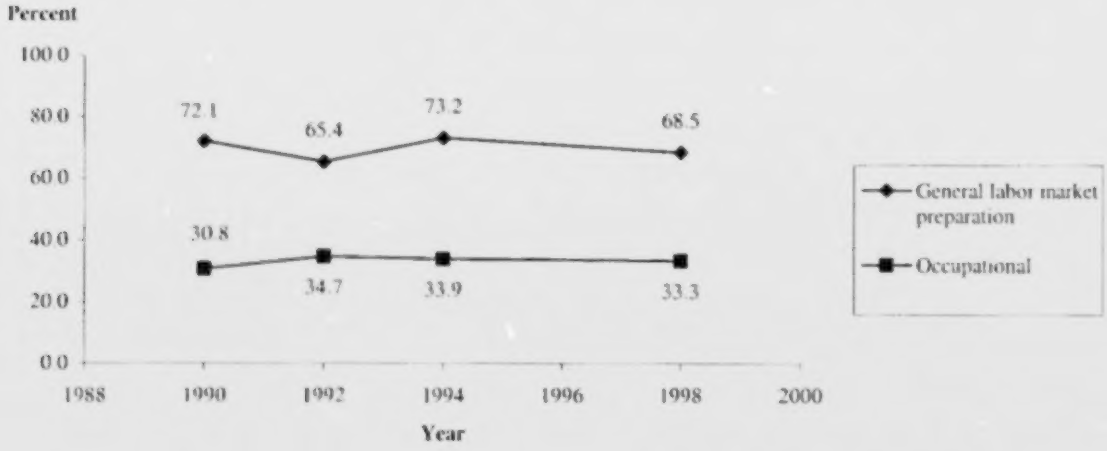
†Not applicable.

[1] In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total general labor market preparation and total computer-related courses are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992, and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 37. Percentage of total general labor market preparation credits and total occupational credits earned by public high school graduates that were computer-related: Various years, 1990–98



SOURCE: U.S. Department of Education, National Center for Education Statistics, National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Computer-related coursetaking within the general labor market preparation curriculum declined, however, from an average of 0.45 credits for 1990 graduates to 0.35 credits for 1998 graduates (figure 36 and table A16).[60] This decline was due primarily to a decrease in basic typewriting/keyboarding coursework. The number of credits that public high school graduates earned on average in basic typewriting/keyboarding courses in high school (all of which were considered to be computer related during the 1990s) declined from 0.45 credits for 1990 graduates to 0.29 credits for 1998 graduates (table A16). In comparison, computer-related technology education coursetaking was first detected in 1994. The 1994 public high school graduates earned on average 0.03 credits in computer-related technology education, after which the average number of credits that 1998 graduates earned in these courses increased to 0.06 credits (table A16).

Trends in Computer-Related Coursetaking Within the Occupational Curriculum

As explained earlier, the discussion of trends in the rest of this chapter covers the entire period from 1982 to 1998. Over this time period, computer-related coursetaking within the occupational curriculum increased. Comparing the classes of 1982 and 1998, graduates earned on average 0.58 more computer-related occupational credits in high school, equivalent to more than one additional half-year course (table A16).

The largest growth in computer-related occupational credits earned by graduates over the period studied was in the business services program area. Comparing the classes of 1982 and 1998, public high school graduates earned on average 0.32 more computer-related credits in business services, compared with 0.20 more credits in computer technology and 0.06 more credits in drafting/graphics (figure 38 and table A16).

Computer-related business services coursetaking increased between 1982 and 1990, although no significant difference was detected between 1990 and 1998.[61] Between 1982 and 1990, public high school graduates earned on average 0.27 more computer-related credits in business services, increasing from 0.01 credits for 1982 graduates to 0.28 credits for 1990 graduates (figure 38 and table A16). As of 1998, graduates earned 0.33 such credits.

Computer-related drafting/graphics coursetaking also increased over the period studied, although half of this increase occurred between 1994 and 1998. Specifically, between 1982 and 1994, public high school graduates earned 0.03 more credits in computer-related drafting/graphics in high school, increasing from 0.00 credits for 1982 graduates to 0.03 credits for

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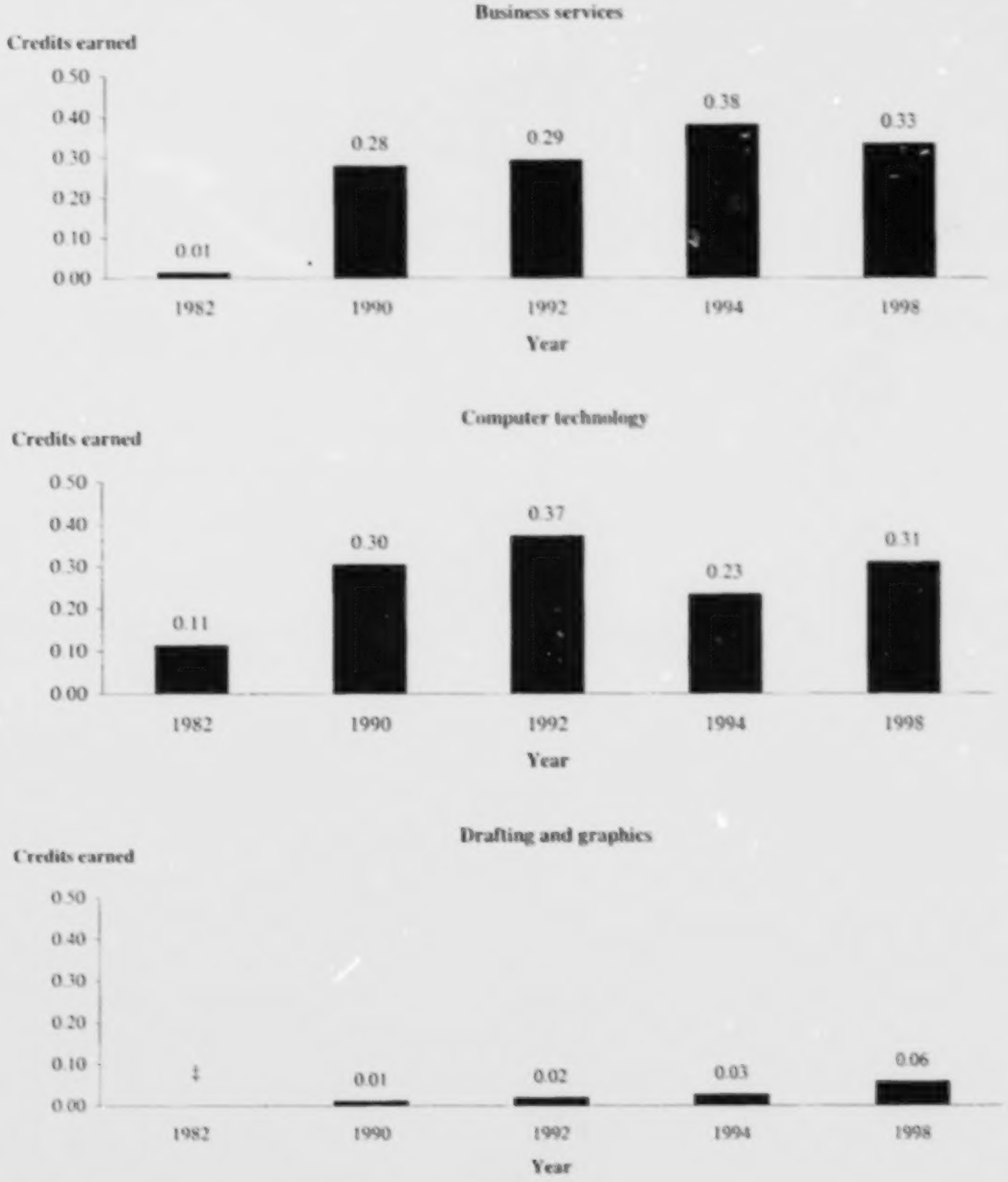
[60] The apparent increase between 1992 and 1994 was not statistically significant.

[61] Although the average credits earned by graduates in these courses increased significantly between 1992 and 1994, the difference between 1990 and 1998 graduates was not statistically significant.

Figure 38. Average number of computer-related credits earned in occupational education by public high school graduates, by occupational program area: Various years, 1982–98



‡Reporting standards not met. (Too few cases.)

NOTE: Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

1994 graduates (figure 38 and table A16). The average number of credits that graduates earned in computer-related drafting/graphics then increased by another 0.03 credits to 0.06 credits for 1998 graduates.

Similar to computer-related business services, coursetaking in computer technology in high school increased between 1982 and 1990, although no significant difference was detected between 1990 and 1998.[62] The average number of credits that public high school graduates earned in computer technology increased by 0.19 credits, from 0.11 credits for 1982 graduates to 0.30 credits for 1990 graduates (figure 38 and table A16). There was no significant difference in the average number of computer technology credits earned by 1990 and 1998 graduates (0.30 credits and 0.31 credits, respectively).

Trends Within the Computer Technology Program Area

Trends in coursetaking also varied among the five computer technology subareas. Although virtually no 1982 graduates took computer applications courses in high school, 1998 graduates earned more credits in computer applications than in any other computer technology field (figure 39 and table A16). The 1982 public high school graduates earned 0.00 credits on average in computer applications, in contrast with 0.05 credits for 1990 graduates. As of the class of 1998, graduates had increased the average number of credits they earned in computer applications courses in high school to 0.16 credits.

Graduates also earned more credits in computer science and systems courses in the 1990s than in 1982. The average number of credits that public high school graduates earned in computer science and systems courses increased from 0.01 credits for 1982 graduates to 0.10 credits for 1990 graduates, and then to 0.20 credits for 1992 graduates (figure 39 and table A16). After 1992, the average number of such credits earned by graduates declined to between 0.08 and 0.09 credits for the classes of 1994 and 1998, respectively. However, the average number of computer science and systems credits that 1994 and 1998 graduates earned was still higher than the average number of such credits earned by 1982 graduates.

Computer programming coursetaking increased between 1982 and 1990 and then returned to the same level of coursetaking as that in 1982. Specifically, public high school graduates earned 0.09 more credits in computer programming courses in high school between 1982 and 1990, increasing from 0.04 credits for 1982 graduates to 0.13 credits for 1990 graduates (figure

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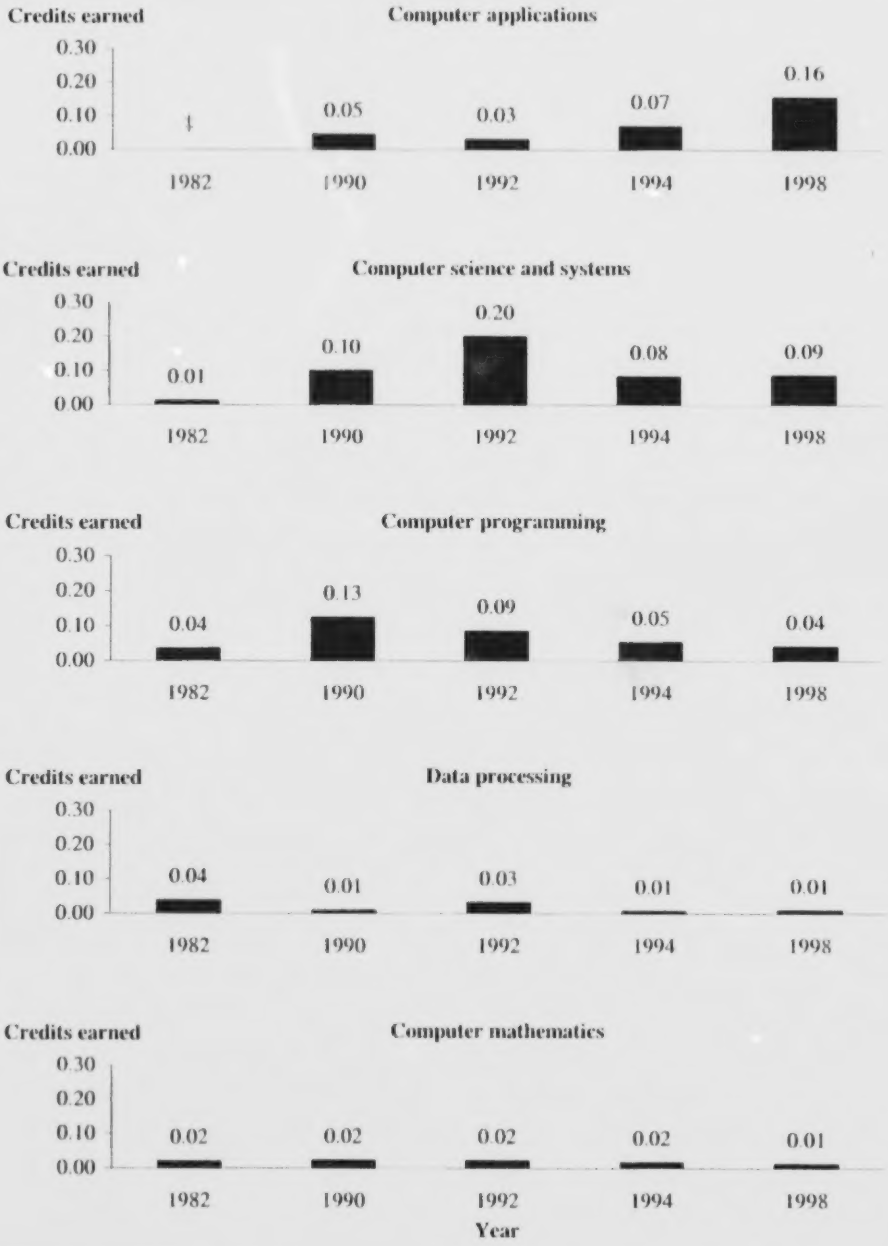
[62] Although average credits earned in computer technology increased between 1990 and 1992, they decreased again by 1994 to a level that was not statistically different from 1998, and the overall change between 1990 and 1998 was not statistically significant.

Figure 39. Average number of computer-related credits earned in the computer technology program area by public high school graduates, by course type: Various years, 1982–98



‡Reporting standards not met. (Too few cases.)

NOTE: Years are not spaced proportionally.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

39 and table A16). The average number of credits that graduates earned in computer programming courses declined back to 0.04 credits for 1998 graduates.[63]

Finally, comparing the classes of 1982 and 1998, data processing coursetaking showed a slight decline, while there was no significant difference in computer mathematics coursetaking (figure 39 and table A16). Public high school graduates generally earned small numbers of credits (0.04 or fewer credits) on average in each of these areas over the entire period studied.

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[63] The decline between 1994 and 1998 was not statistically significant, although the declines between 1990 and 1992, between 1992 and 1994, and overall between 1990 and 1998 were statistically significant.

IV. Trends in Combining Academic and Vocational/Technical Coursetaking

As discussed in chapter I, several pieces of federal legislation in the 1990s focused attention on increasing the academic achievement of participants in vocational/technical education. The Carl D. Perkins Vocational and Applied Technology Act Amendments of 1990 (Perkins II) required that states implement a performance measure of the academic achievement gains of vocational/technical participants, as well as introduced the concepts of integration of academic and vocational/technical education and of tech-prep education. The School-to-Work Opportunities Act of 1994 continued the emphasis on academic achievement, calling for preparing all students for both college *and* work and further encouraging the integration of academic and vocational/technical education and linkages between secondary and postsecondary education.

It is important to remember that almost all high school students take some vocational/technical education, although students take varying amounts and types of these courses and take them for different purposes. Similarly, students combine academic and vocational/technical education in different ways and for different purposes. This chapter examines the various ways that public high school graduates combined academic and vocational/technical education between 1982 and 1998, focusing primarily—although not exclusively—on the academic coursetaking of occupational concentrators. This group is the main focus of federal and state accountability for vocational/technical education.

The Context: Overall Academic Coursetaking Trends in Brief

Between 1982 and 1998, public high school graduates increased both the number and rigor of the academic courses they took in high school. On average, 1998 graduates earned 3.98 more credits in academic courses in high school—equivalent to about four full-year academic courses—and they earned more credits in each academic subject than did 1982 graduates (table 14). In addition, more graduates took advanced coursework in mathematics, science, and English over the period studied (figure 40 and tables A19, A20, A21) (see also Chen et al. forthcoming).[64]

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[64] Advanced mathematics coursework includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and/or calculus. Advanced science coursework includes some combination of chemistry and/or physics, other than consumer or introductory chemistry. Advanced English coursework includes at least some honors English courses. See the appendix D for a more detailed explanation of these measures.

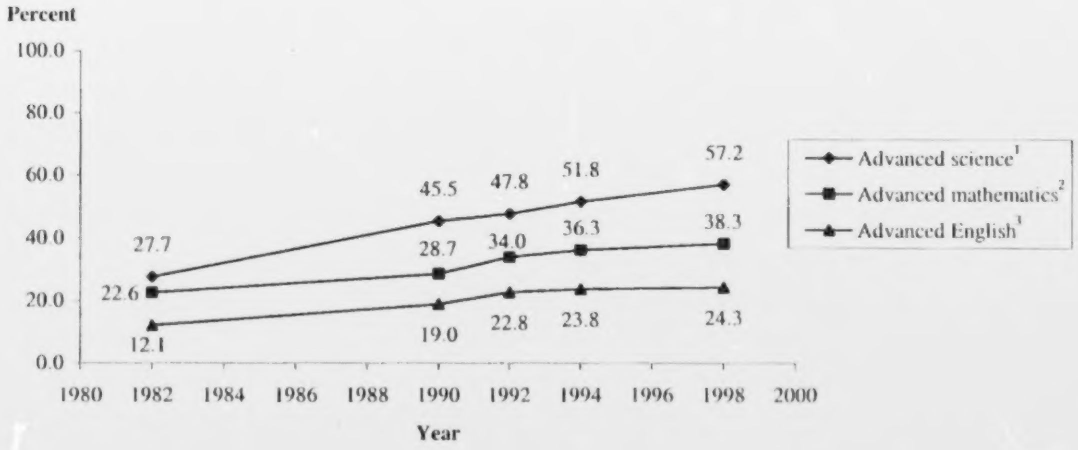
Table 14. Average number of credits earned in academic subjects by public high school graduates, by subject: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	14.28	16.66	17.22	17.58	18.26
Core academics, total	11.87	13.57	13.88	14.21	14.51
English	3.93	4.19	4.24	4.29	4.25
Mathematics	2.62	3.15	3.23	3.33	3.40
Science	2.17	2.76	2.89	3.04	3.12
Social studies	3.14	3.48	3.53	3.55	3.74
Foreign languages	0.95	1.54	1.67	1.71	1.85
Fine arts	1.46	1.55	1.67	1.66	1.90

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 40. Percentage of public high school graduates taking advanced academic coursework, by academic subject: Various years, 1982–98



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[1] Includes chemistry 1 and 2 and physics 1 and 2.

[2] Includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre calculus, introduction to analysis, and calculus.

[3] Includes at least some English coursework in honors courses.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982, National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Was this increased academic coursetaking associated with a decline in vocational/technical coursetaking among students between 1982 and 1998?[65] How did students combine academic and vocational/technical coursetaking over the period studied? To what extent did the academic coursetaking of participants in vocational/technical education increase compared with that of other students? To what extent did students take academic coursework related to their vocational/technical coursework? This chapter addresses these questions.

The Relationship Between Academic and Vocational/Technical Coursetaking

Graduates decreased their average vocational/technical coursetaking by a relatively small amount while taking additional academic coursework over the period studied. In general, students made room for additional academic courses primarily by increasing the total number of credits they earned in high school rather than by reducing their vocational/technical coursetaking. As reported in chapter II, the average number of credits that public high school graduates earned in vocational/technical education decreased from 4.68 credits for 1982 graduates to 4.19 credits for 1990 graduates, with 1998 graduates earning 3.99 vocational/technical credits on average in high school.[66] Thus, 1998 graduates earned 0.69 fewer vocational/technical credits on average than 1982 graduates, while they earned 3.98 more academic credits and 0.25 more enrichment/other credits than their 1982 counterparts (figure 8). Consequently, the total number of credits earned by public high school graduates increased by 3.54 credits on average, from 21.60 credits for 1982 graduates to 25.14 credits for 1998 graduates.

For each graduating class, participants in vocational/technical education earned fewer *core* academic credits in high school than nonparticipants, regardless of the particular measure of participation (table 15).[67, 68] For example, among 1998 graduates, occupational coursetakers earned 1.02 fewer core academic credits on average than graduates taking no occupational courses (14.42 credits versus 15.43 credits). Toward the other end of the participation spectrum, advanced occupational concentrators earned 0.87 fewer core academic credits than 1998 graduates who were not advanced occupational concentrators (13.77 credits versus 14.64 credits).

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[65] This is a different question than that examined in chapter I, which examined whether changes in states' high school graduation requirements were associated with changes in vocational/technical coursetaking between 1990 and 1998.

[66] No significant changes in average vocational/technical credits earned were detected after 1990.

[67] The Secondary School Taxonomy includes non-English (foreign) languages and fine arts under the academic curriculum. However, many states consider these subjects as electives (Snyder and Hoffman 2001, table 154). The rest of this chapter, therefore, focuses primarily—although not exclusively—on the four core academic subjects of English, mathematics, science, and social studies.

[68] There was one exception to this overall pattern. The difference between advanced occupational concentrators with cooperative education and all other 1998 graduates in the number of core academic credits earned was not statistically significant.

Table 15. Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	11.87	13.57	13.88	14.21	14.51
Vocational/technical participation measures					
Vocational/technical coursetakers[1]	11.82	13.54	13.85	14.17	14.47
Occupational coursetakers[2]	11.65	13.46	13.79	14.11	14.42
Vocational/technical investors[3]	11.21	12.91	13.27	13.60	14.00
Occupational investors[4]	10.89	12.58	13.02	13.33	13.88
Occupational concentrators[5]	10.78	12.28	12.73	13.06	13.68
Advanced occupational concentrators[6]	10.79	12.31	12.69	13.01	13.77
Advanced occupational concentrators with cooperative	10.82	12.25	12.40	12.75	14.08
education[7]	10.82	12.25	12.40	12.75	14.08
Vocational/technical nonparticipation measures					
All graduates except vocational/technical coursetakers	14.13	15.00	15.26	15.62	15.81
All graduates except occupational coursetakers	13.57	14.68	14.99	15.22	15.43
All graduates except vocational investors	13.50	14.72	14.88	15.19	15.33
All graduates except occupational investors	12.70	14.32	14.51	14.85	15.01
All graduates except occupational concentrators	12.42	14.07	14.26	14.61	14.79
All graduates except advanced occupational concentrators	12.21	13.81	14.11	14.42	14.64
All graduates except advanced occupational concentrators with cooperative education	11.91	13.63	13.94	14.29	14.53

[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

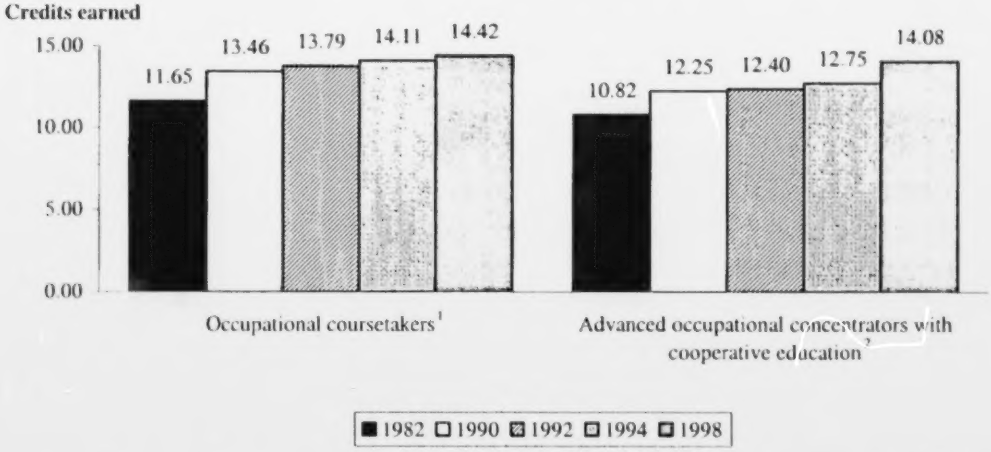
NOTE: Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

In addition, the average number of core academic credits earned by graduates decreased—up to a point—as their involvement in the vocational/technical curriculum increased. For example, for the class of 1998, occupational concentrators earned 0.79 fewer core academic credits than vocational/technical coursetakers (13.68 credits versus 14.47 credits) (table 15). However, the average number of core academic credits earned by vocational/technical participants appeared to increase with advanced occupational coursetaking,[69] such that the difference in core academic credits earned by 1998 graduates who were vocational/technical coursetakers and those who were advanced occupational concentrators with cooperative education was not statistically significant.

Like graduates in general, participants in vocational/technical education increased their academic coursetaking in high school over the period studied. According to all measures of vocational/technical participation presented in table 15, 1998 graduates earned more core academic credits than their 1982 counterparts. For example, occupational coursetakers earned 2.77 more core academic credits over the period, increasing from 11.65 credits for 1982 graduates to 14.42 credits for 1998 graduates (figure 41 and table 15). Similarly, at the other end of the vocational/technical participation spectrum, advanced occupational concentrators with 1.0 or more

Figure 41. Average number of credits earned in core academic subjects by public high school graduates, by selected vocational/technical coursetaking measures: Various years, 1982–98



[1]Graduates earning greater than 0.0 credits in occupational education.

[2]Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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[69] However, the difference in average number of core academic credits earned between occupational concentrators and advanced concentrators with cooperative education was not statistically significant.

credits of cooperative education in their area of concentration earned 3.26 more core academic credits, increasing from 10.82 credits for 1982 graduates to 14.08 credits for 1998 graduates.

Trends in the Academic Coursetaking of Occupational Concentrators

Overview

Both occupational concentrators (graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) and nonconcentrators (all graduates except occupational concentrators) increased the number and rigor of the academic courses they took between 1982 and 1998. In some instances, the rate of increase was greater for occupational concentrators, possibly because they took fewer and less rigorous academic courses than nonconcentrators at the beginning of the period. Nevertheless, among 1998 graduates, occupational concentrators still took fewer and less rigorous academic courses in high school than nonconcentrators.

However, differences between occupational concentrators and nonconcentrators in mathematics, English, and social studies coursetaking were fairly small, and the level of coursetaking for both groups was fairly high in these subjects, compared with the level of science coursetaking. For example, among 1998 graduates, differences between occupational concentrators and nonconcentrators in the number of credits earned in English, mathematics, and social studies were less than 0.40 credits (ranging from 0.18 credits to 0.27 credits), while the difference between these two groups in science was 0.40 credits (table 16). Similarly, among 1998 graduates, more than 75 percent of both occupational concentrators and nonconcentrators met the New Basics core academic standards[70] in mathematics, English, and social studies, while less than 75 percent of these groups met the standard in science (table 17).[71] In addition, the gap between occupational concentrators and nonconcentrators in the percentage of graduates meeting the New Basics standards was larger in science than in English or social studies (15.2 percentage points versus 3.7 percentage points and 4.4 percentage points, respectively) (table 17).[72] The gap between concentrators and nonconcentrators in science coursetaking was larger in chemistry than in biology (see the section on trends in specific academic coursetaking below).

These general findings are reviewed in more detail in the remainder of this section.

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[70] The New Basics core academic standards include 4 years of English, and 3 years each of mathematics, science, and social studies (National Commission on Excellence in Education 1983).

[71] The 73.7 percent of nonconcentrators meeting the science standard was not statistically different from 75 percent.

[72] The 6.8 percentage point gap between occupational concentrators and nonconcentrators in mathematics was not statistically different from the corresponding science gap of 15.2 percentage points.

Table 16. Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status and subject area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	11.87	13.57	13.88	14.21	14.51
Occupational concentrators[1]					
All core academic subjects	10.78	12.28	12.73	13.06	13.68
English	3.79	4.02	4.11	4.16	4.12
Mathematics	2.25	2.80	2.87	3.02	3.21
Science	1.74	2.26	2.47	2.59	2.82
Social studies	3.00	3.19	3.28	3.30	3.54
Nonconcentrators[2]					
All core academic subjects	12.42	14.07	14.26	14.61	14.79
English	4.01	4.26	4.28	4.33	4.29
Mathematics	2.80	3.29	3.35	3.44	3.46
Science	2.39	2.94	3.03	3.20	3.23
Social studies	3.22	3.58	3.61	3.64	3.81

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table 17. Percentage of public high school graduates meeting New Basics standards in core academic subjects, by occupational concentration status and academic subject area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	13.1	38.1	42.1	50.2	56.0
Occupational concentrators[1]					
All core academic subjects	5.0	18.5	24.4	33.2	45.7
English	57.7	78.7	82.1	88.7	82.0
Mathematics	29.4	57.1	59.5	70.7	78.7
Science	13.2	29.5	36.8	45.1	58.4
Social studies	62.1	77.4	82.3	84.1	90.9
Nonconcentrators[2]					
All core academic subjects	17.1	45.7	47.9	56.0	59.4
English	65.5	85.5	86.6	88.6	85.8
Mathematics	54.7	78.0	80.6	84.5	85.5
Science	37.4	60.7	62.6	70.3	73.7
Social studies	70.8	89.0	88.6	91.3	95.3

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] All graduates except occupational concentrators.

NOTE: New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

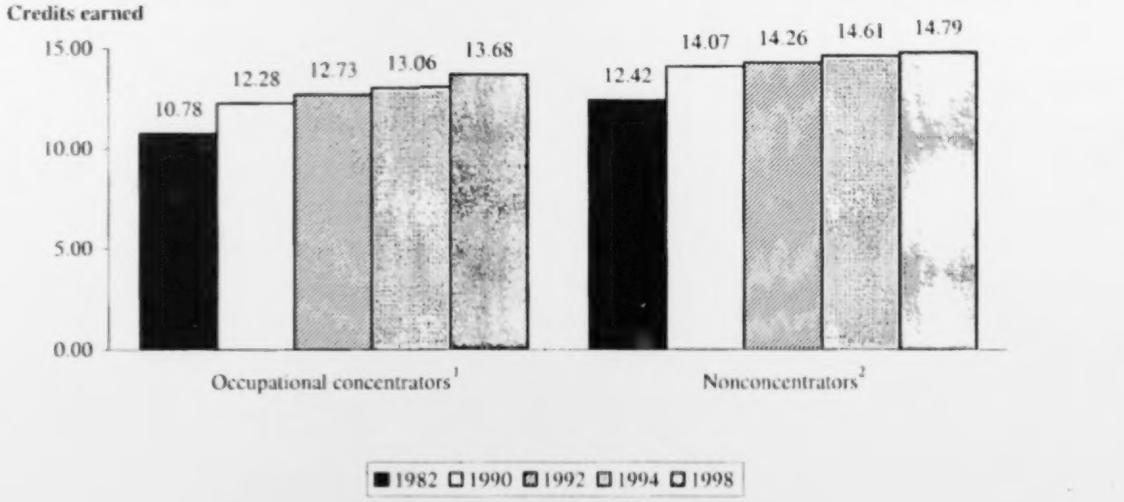
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Overall Academic Coursetaking

Occupational concentrators who were members of the class of 1998 earned 2.90 more credits in core academic subjects (English, mathematics, science, and social studies) than their 1982 counterparts, a larger increase than the 2.37 additional core academic credits earned by nonconcentrators over the same period (figure 42 and table 16). However, as of 1998, occupational concentrators still earned 1.11 fewer credits—equivalent to about one less full-year course—in core academic subjects in high school than nonconcentrators. Among 1998 graduates, occupational concentrators earned 13.68 credits in core academic subjects, compared with 14.79 credits for nonconcentrators.

Comparing the classes of 1982 and 1998, the percentages of occupational concentrators and nonconcentrators meeting all of the New Basics core academic standards increased by *amounts*

Figure 42. Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status: Various years, 1982–98



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[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

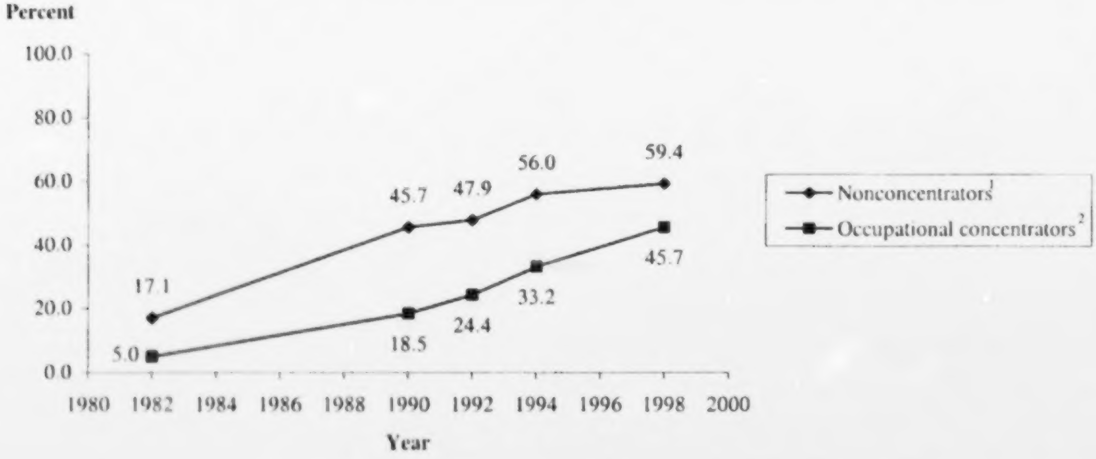
[2] Includes all graduates except occupational concentrators.

NOTE: Core academic subjects include English, mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

that were not statistically different from each other (by about 41 to 42 percentage points) (figure 43 and table 17). However, the *rates* of increase differed because occupational concentrators were less likely than nonconcentrators to meet the New Basics core academic standards in 1982. The percentage of occupational concentrators who met all of the New Basics core academic standards increased by 800 percent between the classes of 1982 and 1998, compared with an increase of about 250 percent for nonconcentrators. Nevertheless, among 1998 graduates, occupational concentrators were still less likely than nonconcentrators to meet all of the New Basics core academic standards (45.7 percent versus 59.4 percent).

Figure 43. Percentage of public high school graduates meeting the New Basics standards in core academic subjects, by occupational concentration status: Various years, 1982–98



[1] Includes all graduates except occupational concentrators.

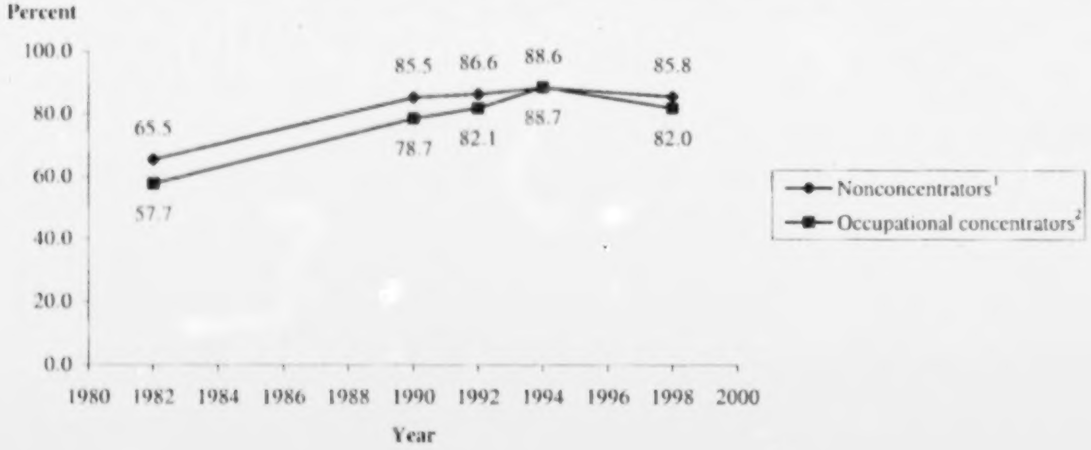
[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: New Basics core academic standards include 4 years of English and 3 years each of mathematics, science, and social studies.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Patterns were similar when examining trends in mathematics and science coursetaking. That is, increases between 1982 and 1998 in average credits earned (table 16) and in the percentage of graduates meeting New Basics standards (table 17 and figures 44–47) were greater for occupational concentrators than for nonconcentrators in these two subjects.[73] In addition, among 1998 public high school graduates, occupational concentrators generally earned fewer credits on average and were less likely to meet the New Basics standard in each core academic subject compared to nonconcentrators.[74]

Figure 44. Percentage of public high school graduates earning 4.0 or more credits in English, by occupational concentration status: Various years, 1982–98



[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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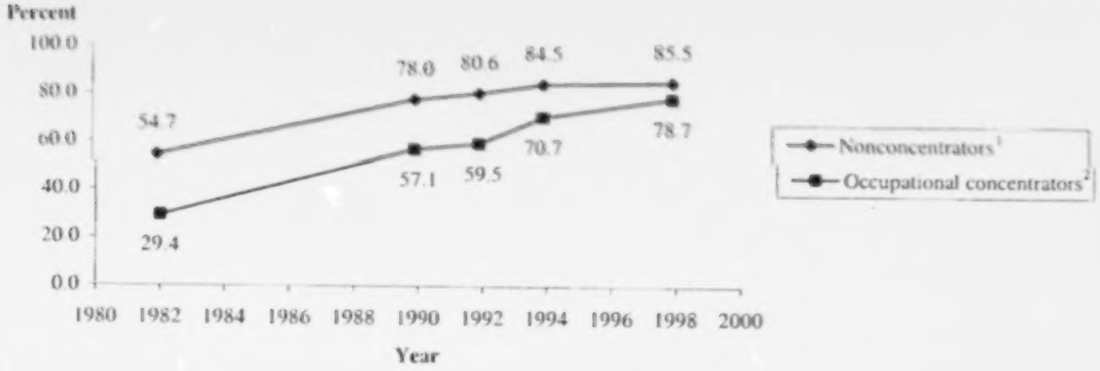
[73] Apparent differences between occupational concentrators and nonconcentrators in English and in social studies were not statistically significant.

[74] One exception was that the difference between occupational concentrators and nonconcentrators in the percentage of 1998 graduates meeting the New Basics standard in English was not statistically significant.

Figure 45. **Percentage of public high school graduates earning 3.0 or more credits in mathematics, by occupational concentration status: Various years, 1982–98**



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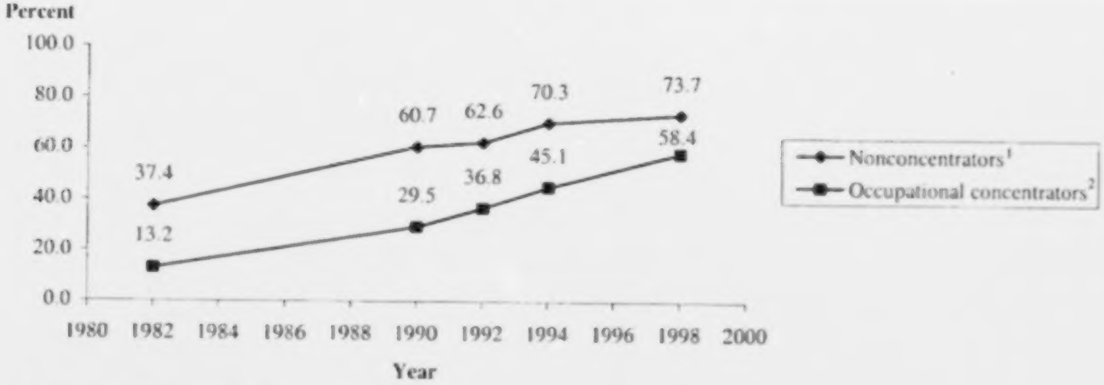
[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 46. **Percentage of public high school graduates earning 3.0 or more credits in science, by occupational concentration status: Various years, 1982–98**



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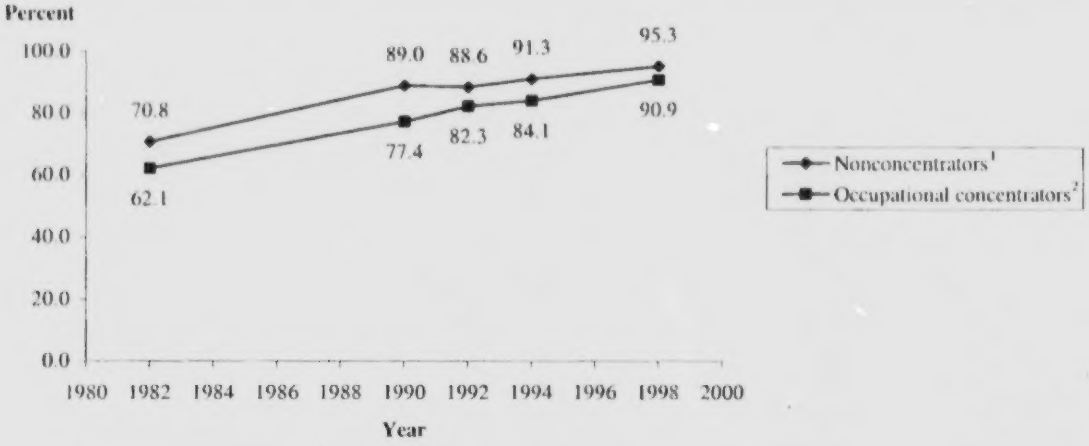
[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 47. Percentage of public high school graduates earning 3.0 or more credits in social studies, by occupational concentration status: Various years, 1982–98



[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Trends in Specific Academic Coursetaking

This section examines coursetaking trends for specific courses within the mathematics, science, and social studies subject areas.

Trends in specific mathematics and science coursetaking generally followed the above patterns. The percentage of occupational concentrators who took algebra 1 or higher mathematics and who took biology increased at higher rates between 1982 and 1998 than the percentage of nonconcentrators who took these courses (figures 48 and 49 and table A22).[75] In addition, although the increase was larger for occupational concentrators than for nonconcentrators, among 1998 graduates, concentrators were still less likely than nonconcentrators to take these courses in high school. As of 1998, occupational concentrators were also less likely than nonconcentrators to take chemistry and physics courses. The largest increase in science coursetaking for both concentrators and nonconcentrators over the period studied was in chemistry. Despite this increase,

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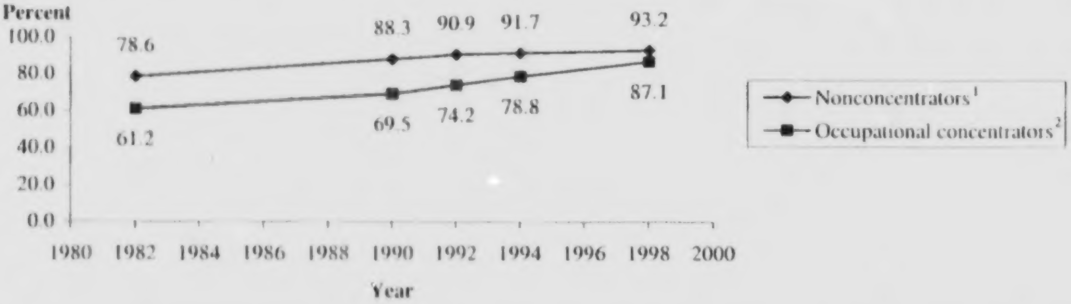
[75] Apparent differences between occupational concentrators and nonconcentrators in chemistry and in physics were not statistically significant.

Figure 48. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status: Various years, 1982–98



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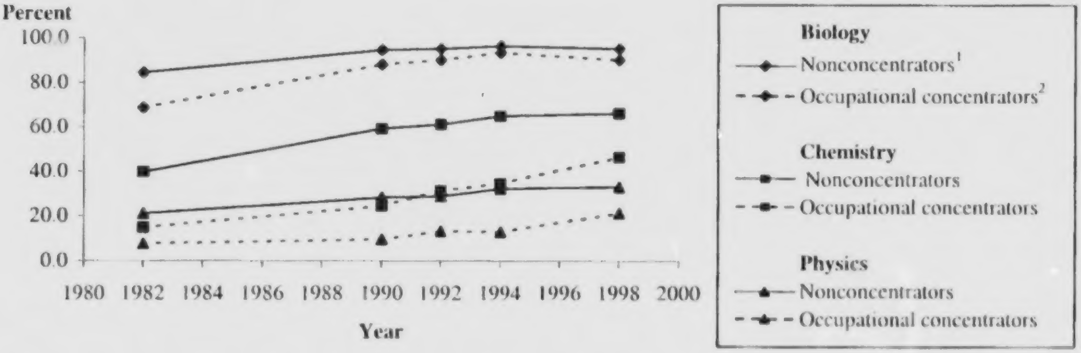
[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 49. Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98



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[1] Includes all graduates except occupational concentrators.

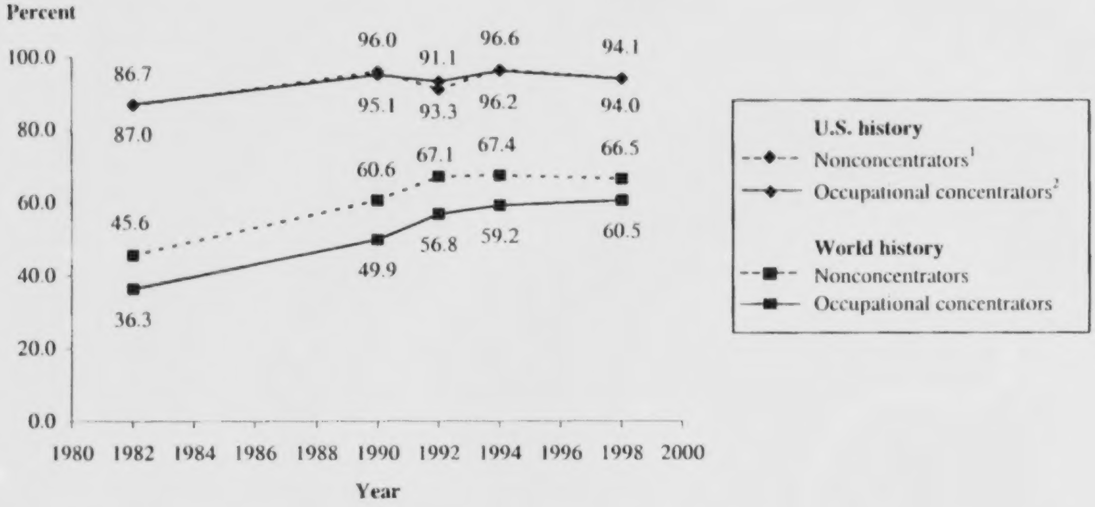
[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

the gap between occupational concentrators and nonconcentrators as of 1998 was significantly larger in chemistry than in biology.[76]

With regard to social studies coursetaking, both occupational concentrators and nonconcentrators increased their coursetaking in both U.S. history and world history over the period studied. Moreover, occupational concentrators and nonconcentrators increased their U.S. history and world history coursetaking by statistically similar amounts between 1982 and 1998. As of 1998, there was no significant difference in the percentage of occupational concentrators and nonconcentrators who took either type of history in high school (figure 50 and table A23).[77]

Figure 50. Percentage of public high school graduates completing specific history courses, by occupational concentration status: Various years, 1982–98



[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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[76] The gap as of 1998 between occupational concentrators and nonconcentrators in physics was not statistically significant from the corresponding gap in chemistry.

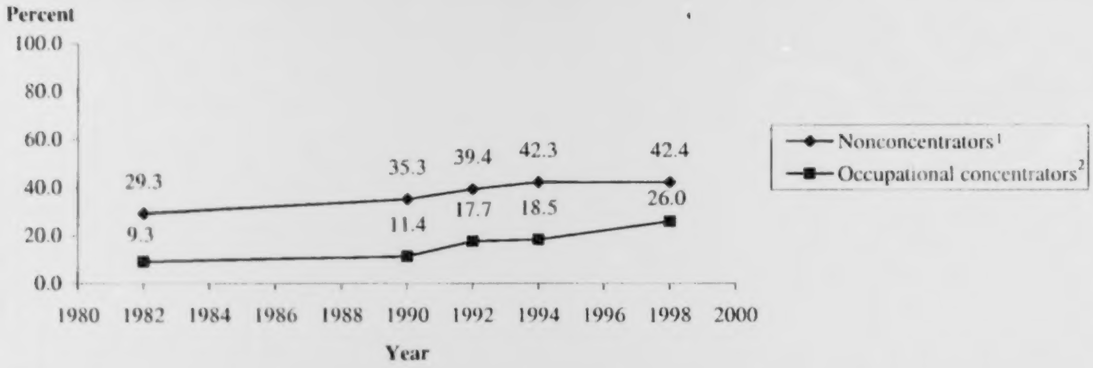
[77] The apparent difference as of 1998 between occupational concentrators and nonconcentrators in world history was not statistically significant.

Trends in Advanced Academic Coursetaking

Finally, with regard to advanced academic coursetaking, the percentage of occupational concentrators and nonconcentrators who completed advanced coursework in mathematics (coursework beyond algebra 2), science (chemistry and/or physics), and English (at least some honors-level English coursework) increased by statistically similar amounts (figures 51, 52, and 53 and tables A19–A21). However, among 1998 graduates, occupational concentrators were less likely than nonconcentrators to complete advanced coursework in each of these subjects in high school.

Finally, the gap in mathematics coursetaking between occupational concentrators and nonconcentrators was larger in terms of the rigor of this coursetaking than in the number of courses these graduates took. Specifically, the gap between occupational concentrators and nonconcentrators in the percentage of 1998 graduates completing advanced coursework in mathematics (including mathematics above algebra 2) was greater than the gap in the percentage of these graduates taking 3 years of mathematics (16.5 percentage points versus 6.8 percentage points) (table A19 and table 17). In contrast, the gaps between occupational concentrators and nonconcentrators in the percentage of 1998 graduates completing advanced coursework in English and

Figure 51. Percentage of public high school graduates completing advanced mathematics coursework, by occupational concentration status: Various years, 1982–98



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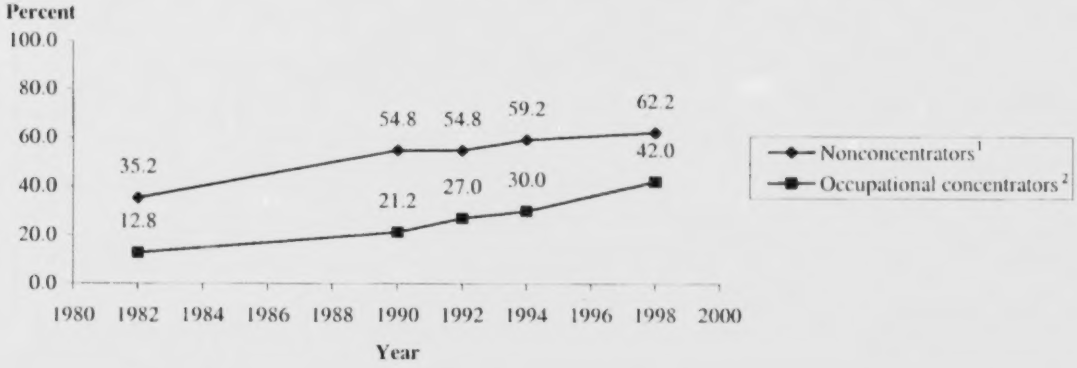
[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced mathematics coursework includes algebra 3, trigonometry, analytic geometry, linear algebra, probability and statistics, precalculus, introduction to analysis, and/or calculus.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 52. Percentage of public high school graduates completing advanced science coursework, by occupational concentration status: Various years, 1982–98



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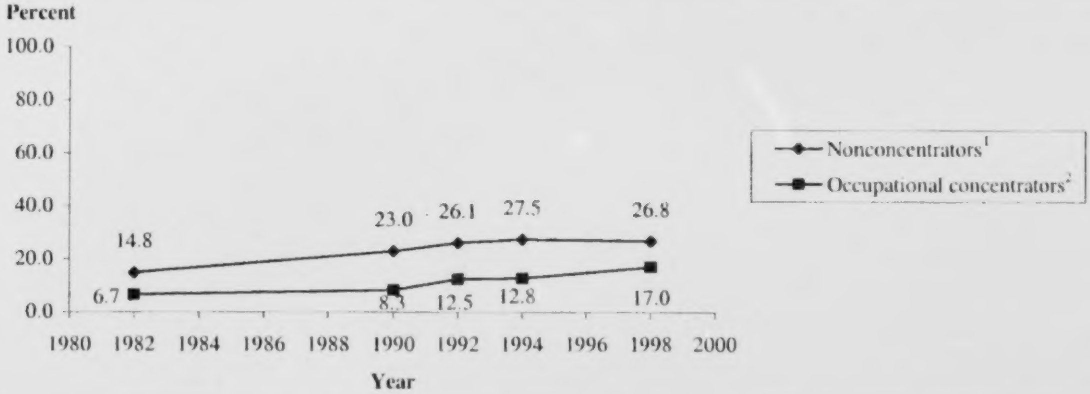
[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced science coursework includes chemistry 1 and 2 and physics 1 and 2.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Figure 53. Percentage of public high school graduates completing advanced English coursework, by occupational concentration status: Various years, 1982–98



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[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: Advanced English coursework includes at least some honors courses.

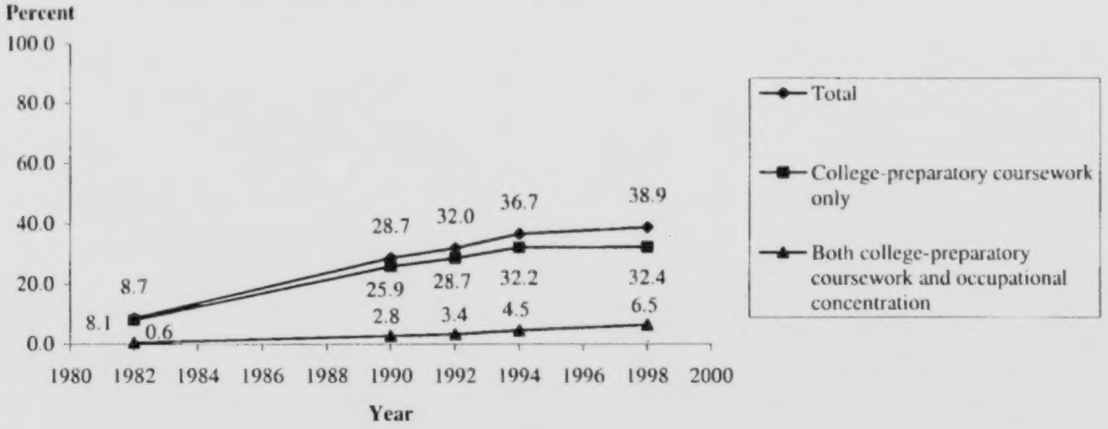
SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

science were not statistically different from the corresponding gaps in the percentage of these graduates meeting the New Basics standards in these two subjects (tables A20–A21 and table 17).

Combining College-Preparatory and Occupational Coursework

In keeping with increasing academic coursetaking in general, high school students were more likely to complete college-preparatory coursework over the period studied.[78] The percentage of public high school graduates completing college-preparatory coursework in high school increased by about 4.5 times over this period, from 8.7 percent for 1982 graduates to 38.9 percent for 1998 graduates (figure 54 and table A24). The 1998 graduates were also more likely to com-

Figure 54. Percentage of public high school graduates completing a college-preparatory course of study, by whether graduates completed college-preparatory coursework only or also an occupational concentration: Various years, 1982–98



NOTE: Detail may not sum to totals because of rounding. College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Concentrating in occupational education refers to earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

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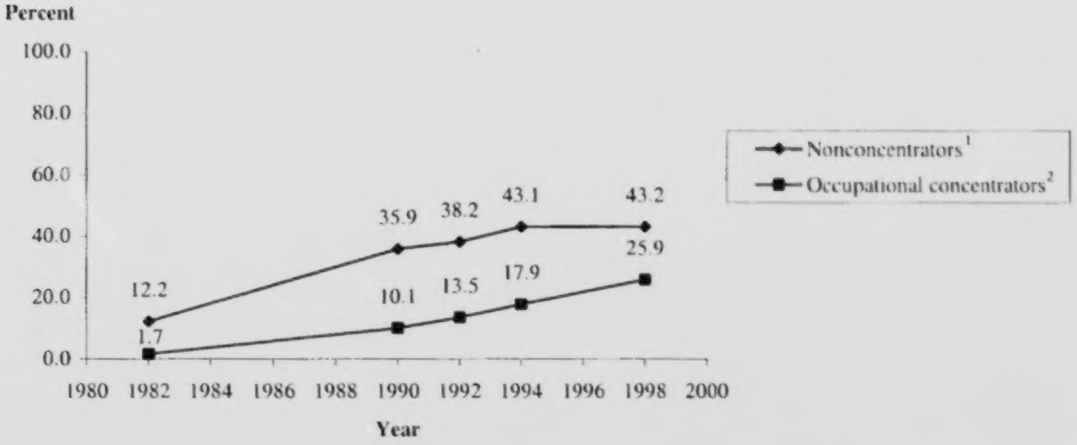
[78] College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. These criteria were based on a review of entrance requirements at public 4-year postsecondary institutions in Flanagan (1992) and were first used in Levesque et al. (2000).

bine college-preparatory and occupational coursework than their 1982 counterparts. Specifically, the percentage of public high school graduates completing both college-preparatory coursework and an occupational concentration increased by about 11 times, from 0.6 percent for 1982 graduates to 6.5 percent for 1998 graduates (figure 54 and table A25).

Occupational Concentrators and College-Preparatory Coursework

The percentage of occupational concentrators (graduates earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3) who completed college-preparatory coursework increased about 15 fold over the period studied, from 1.7 percent for 1982 graduates to 25.9 percent for 1998 graduates (figure 55 and table A24). Among the five relevant academic subjects, occupational concentrators who were members of the class of 1998 were most likely to

Figure 55. Percentage of public high school graduates completing college-preparatory coursework, by occupational concentration status: Various years, 1982–98



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[1] Includes all graduates except occupational concentrators.

[2] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

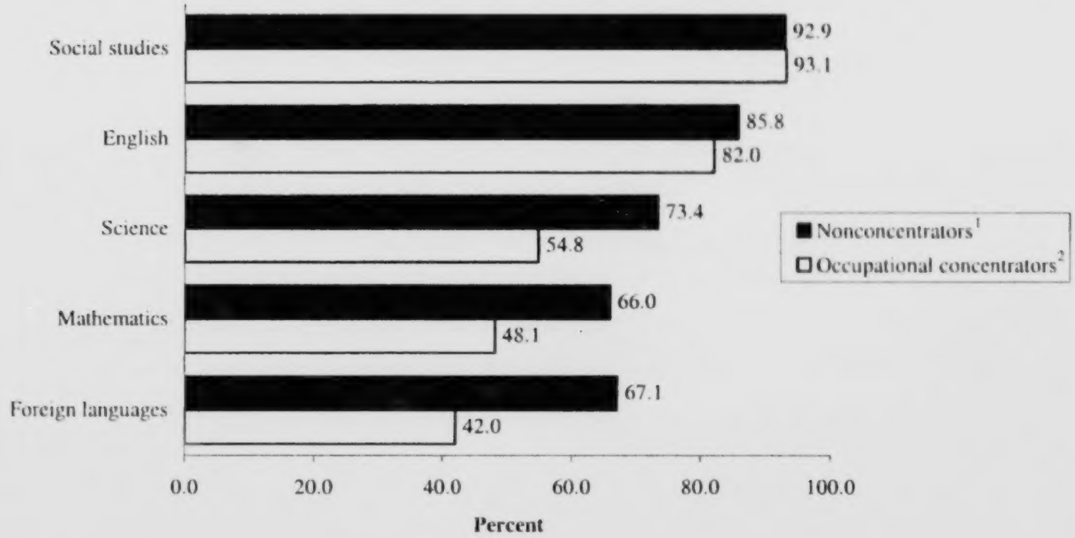
NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

meet the college-preparatory criteria in social studies (figure 56 and table A26). In contrast, they were less likely to meet the college-preparatory criteria in foreign languages than in social studies, English, or science.[79]

Occupational concentrators were less likely than nonconcentrators to complete college-preparatory coursework. Among 1998 graduates, 25.9 percent of occupational concentrators completed college-preparatory coursework, compared with 43.2 percent of nonconcentrators (figure 55 and table A26). Occupational concentrators were also less likely than nonconcentrators to complete the college-preparatory criteria in foreign languages, science, and mathematics (figure 56 and table A26).

Figure 56. Percentage of public high school graduates completing college-preparatory coursework, by academic subject and occupational concentration status: 1998



[1]Includes all graduates except occupational concentrators.

[2]Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

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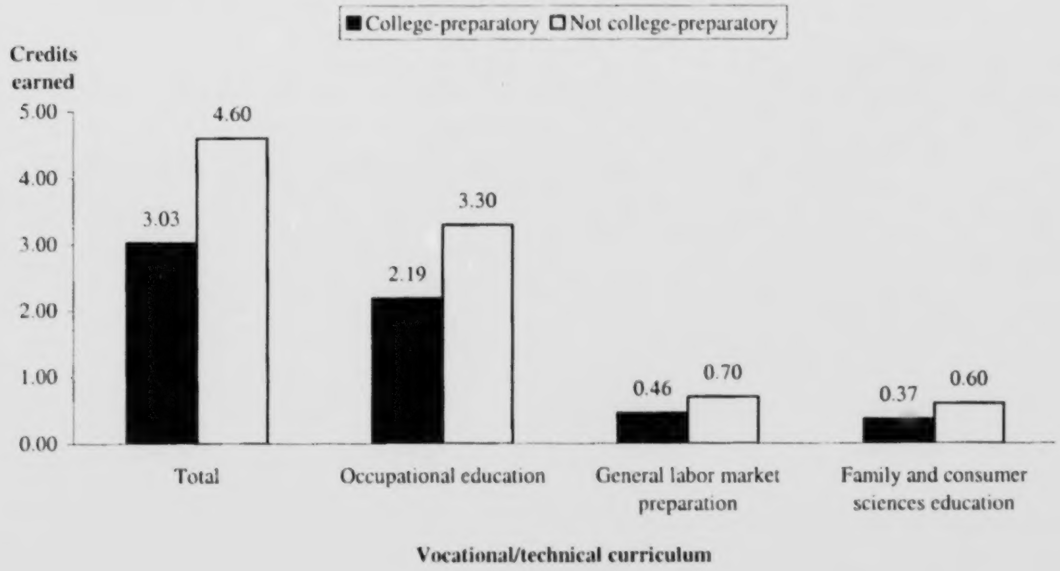
[79] The apparent difference between foreign languages and mathematics was not statistically significant.

College-Preparatory Completers and Vocational/Technical Coursetaking

As mentioned in chapter I, high school students take varying amounts and types of vocational/technical courses and take these courses for different purposes. This section briefly examines the vocational/technical coursetaking of public high school graduates who completed college-preparatory coursework.

High school students completing college-preparatory coursework took fewer vocational/technical courses overall and in each of the three vocational/technical subcurricula than non-college-preparatory students. Among 1998 public high school graduates, those completing college-preparatory coursework earned 1.57 fewer vocational/technical credits on average than other graduates (figure 57 and table A27). Most of this difference was in occupational education, with college-preparatory completers earning 1.11 fewer occupational credits than other 1998 graduates—the equivalent of about one full-year occupational course. However, a majority of

Figure 57. Average number of credits earned by public high school graduates in vocational/technical education, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: 1998



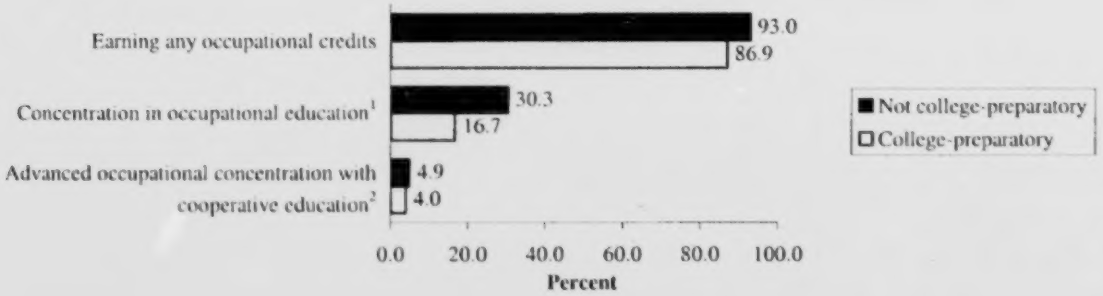
NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

college-preparatory completers (86.9 percent) who were members of the class of 1998 took at least one occupational course (earned at least some occupational credits) (figure 58 and table A28).[80]

Graduates completing college-preparatory coursework were also less likely than other graduates to be occupational concentrators. Among 1998 public high school graduates, 16.7 percent of graduates completing college-preparatory coursework were occupational concentrators, compared with 30.3 percent of graduates who did not complete such coursework (figure 58 and table A28). However, based on the strictest participation measure, there was no significant difference in vocational/technical coursetaking between college-preparatory completers and other graduates. Specifically, there was no significant difference between 1998 graduates who completed college-preparatory coursework and those who did not complete such coursework in their likelihood of completing an advanced occupational concentration with cooperative education (that is, earning 3.0 or more credits in one of the 10 broad occupational program areas in figure 3 with at least 1.0 credit in cooperative education in the area) (4.9 percent versus 4.0 percent).

Figure 58. Percentage of public high school graduates participating in vocational/technical education, by selected participation measures and whether graduates completed college-preparatory coursework: 1998



¹Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

²Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

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[80] This rate of coursetaking was lower than that for all other graduates (93.0 percent).

Looking at specific areas of occupational concentration, graduates completing college-preparatory coursework were more likely than other graduates to concentrate (earn 3.0 or more credits) in the communications technology program area. Specifically, among 1998 graduates, 1.3 percent of college-preparatory completers concentrated in communications technology, compared with 0.6 percent of graduates who did not complete college-preparatory coursework (figure 59 and table A29). In contrast, college-preparatory completers were less likely than other 1998 graduates to concentrate in the program areas of mechanics and repair, construction, agriculture, print production, marketing, food service and hospitality, child care and education, and personal and other services. However, there were no significant differences between the concentration rates of college-preparatory completers and other 1998 graduates in business management, business services, health care, other precision production, transportation, computer technology, and other technology program areas.[81]

Related Academic and Occupational Coursetaking

As described at the beginning of this chapter, both Perkins II and the School-to-Work Opportunities Act called for integrating academic and vocational/technical education. While integration can take many forms, one form that can be examined through transcript studies is whether occupational concentrators took academic courses related to their area of concentration. Table 18 identifies academic courses that were judged to be related to the 18 narrow occupational program areas examined in this report, based on expert advice from members of NCES' Technical Review Panel for vocational education about the academic knowledge required in high-quality programs in each occupational area. English courses were not included in the table because they were judged to be relevant to all program areas. Because of small sample sizes, only 15 occupational program areas had sufficient data to produce reliable estimates.[82]

One piece of evidence that occupational concentrators are pursuing an "integrated" vocational/technical and academic program would be above-average rates of coursetaking in related academic subjects. The following analysis compares related academic coursetaking rates for 1998 graduates concentrating (earning 3.0 or more credits) in specific occupational programs in high school with the overall academic coursetaking rate for 1998 public high school graduates. This comparison makes it possible to identify those occupational program areas in which concentrators took related academic courses at above- or below-average rates. It is important to remember, however, that some related academic skills may also be taught within occupational

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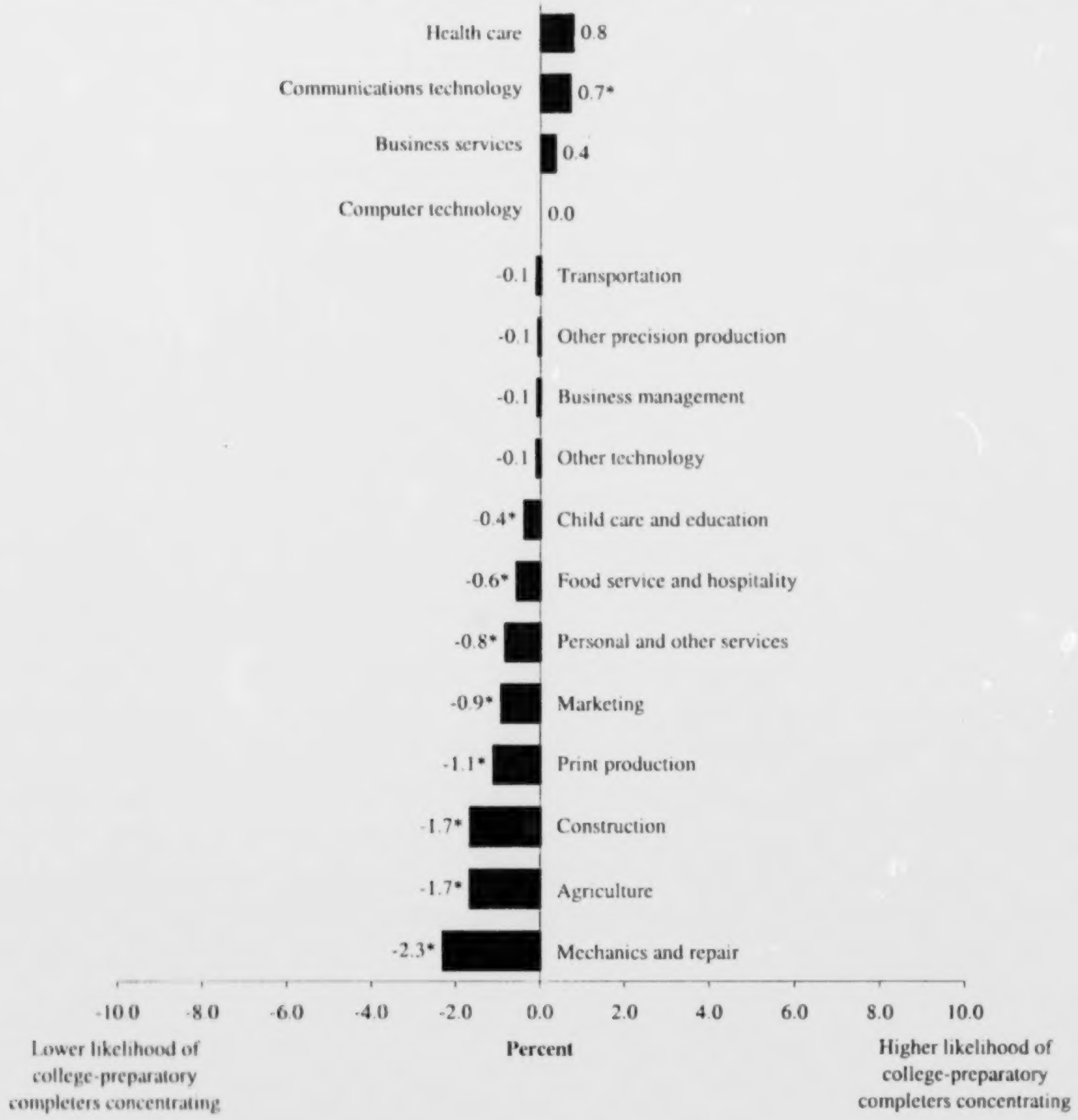
[81] There were too few college-preparatory completers concentrating in protective services and in materials production (including metals, woods, and plastics) to produce reliable estimates.

[82] The three program areas with insufficient data included protective services, transportation, and "other" technology. There were not enough graduates concentrating in these areas in the survey samples to produce reliable estimates.

Figure 59. Difference between college-preparatory completers and other graduates in the percentage of graduates concentrating in occupational education, by program area: 1998



*These differences were statistically significant; all others were not statistically significant. Health care was not statistically significant due to large standard errors.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra I or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed. Comparisons for protective services and materials production are not listed, because estimates were too small to report in these program areas.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table 18. Academic coursetaking judged to be related to coursework in specific occupational program areas

	Mathematics		Science		
Occupational program area	Algebra 1 (or higher)	Geometry	Regular or advanced biology[1]	Regular or advanced chemistry[1]	Physics[2]
Agriculture	✓		✓		
Business management	✓				
Business services	✓				
Marketing	✓				
Health care	✓		✓	✓	
Protective services					
Construction	✓	✓			
Mechanics and repair	✓				✓
Print production	✓	✓			
Materials production	✓				✓
Other precision production	✓				✓
Transportation	✓				✓
Computer technology	✓				✓
Communications technology	✓				✓
Other technology	✓			✓[3]	✓
Food service and hospitality				✓	
Child care and education					
Personal and other services				✓[4]	

[1] Because policymakers are concerned about whether students in occupational programs receive high-level related academics, basic biology and basic chemistry courses were excluded from the analysis.

[2] In the Secondary School Taxonomy (SST), the physics category includes Principles of Technology courses.

[3] Chemistry is related to chemical technology coursework.

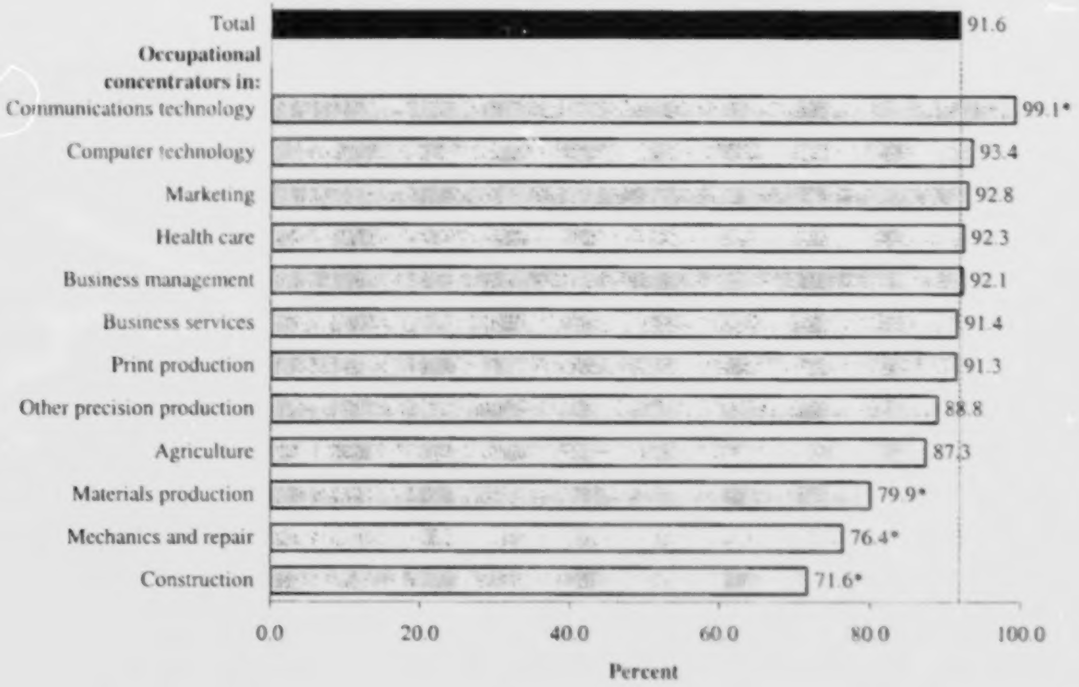
[4] Chemistry is related to cosmetology coursework.

courses. Because it is not possible to determine the extent of this teaching from transcript studies, the report does not address related academics that are embedded in occupational courses.

Related Mathematics

Coursework in algebra 1 or higher mathematics was identified as important for 12 out of the 15 occupational program areas with sufficient data (table 18). Among 1998 graduates, most occupational concentrators (87.1 percent) took algebra 1 or higher mathematics courses (table A30). However, coursetaking varied by program area. Among the 12 program areas in which algebra 1 or higher mathematics was identified as important, 1 exhibited a coursetaking rate that was above the average for all 1998 graduates (communications technology) (figure 60 and table A30). In contrast, 3 of the 12 program areas exhibited below-average rates (construction, mechanics and repair, and materials production). In the remaining 8 program areas (computer technology, marketing, health care, business management, business services, print production, other precision production, and agriculture), coursetaking rates were not statistically different from the average for all 1998 graduates. For example, 99.1 percent of 1998 graduates concentrating in communications technology took algebra 1 or higher mathematics, a rate that was 7.4 percentage points higher than the average rate of 91.6 percent for all 1998 public high school graduates. In contrast, 71.6 percent of 1998 graduates concentrating in construction took algebra 1 or higher mathematics, a rate that was 20.0 percentage points lower than the average rate for all 1998 graduates.

Figure 60. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by related occupational concentration area: 1998



*These program areas were statistically different from the total; all others were not statistically different.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

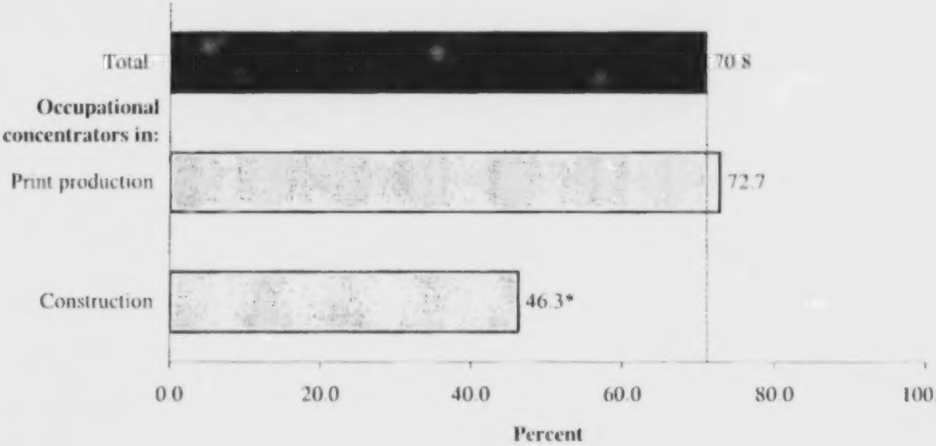
Coursework in geometry was identified as important for the construction and print production program areas (the latter including drafting programs). While 1998 graduates concentrating in print production took geometry at a rate that was not significantly different from the average rate for all 1998 graduates (72.7 percent versus 70.8 percent), 1998 graduates concentrating in construction exhibited a below-average geometry coursetaking rate (46.3 percent versus 70.8 percent) (figure 61 and table A31).

Related Science

Concentrators in two occupational program areas were identified as benefiting from related coursework in regular or advanced biology: agriculture and health care. However, neither health care concentrators nor agriculture concentrators exhibited biology coursetaking rates that were statistically different from the average for all 1998 public high school graduates (figure 62 and table A32).

Concentrators in three occupational program areas were identified as potentially benefiting from related coursework in regular or advanced chemistry: health care, food service and hospitality, and personal and other services (especially cosmetology). Among 1998 graduates, food

Figure 61. Percentage of public high school graduates taking geometry courses, by related occupational concentration area: 1998

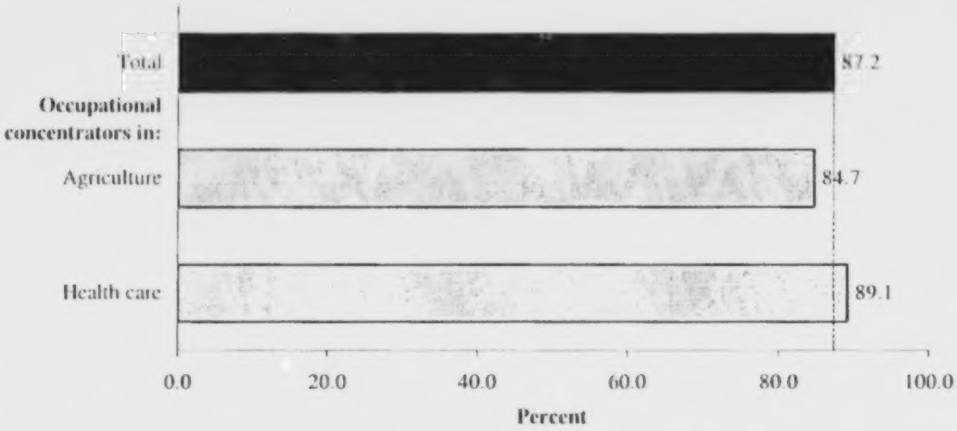


*This program area was statistically different from the total, while the other was not.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Figure 62. Percentage of public high school graduates taking regular or advanced biology courses, by related occupational concentration area: 1998



NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed. Neither program area was statistically different from the total.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

service and hospitality concentrators and personal and other services concentrators exhibited below-average chemistry coursetaking rates (figure 63 and table A33). For example, 16.4 percent of 1998 graduates concentrating in food service and hospitality took regular or advanced chemistry, a rate that was 38.1 percentage points lower than the average rate of 54.5 percent for all 1998 public high school graduates. In contrast, health care concentrators exhibited a chemistry coursetaking rate that was not statistically different from the average rate for all 1998 graduates.

Several trade and industry program areas and technology program areas were identified as benefiting from related coursework in physics (table 18).[83] Of the five related programs with sufficient data, two programs exhibited below-average rates of physics coursetaking (mechanics and repair and materials production) (figure 64 and table A34). For example, 9.3 percent of 1998 graduates concentrating in mechanics and repair took physics, a rate that was 17.4 percentage points lower than the average rate of 26.7 percent for all 1998 graduates. In contrast, occupational concentrators in three program areas (computer technology, communications technology, and other precision production) exhibited rates of physics coursetaking that were not statistically different from the average rate for all 1998 graduates.

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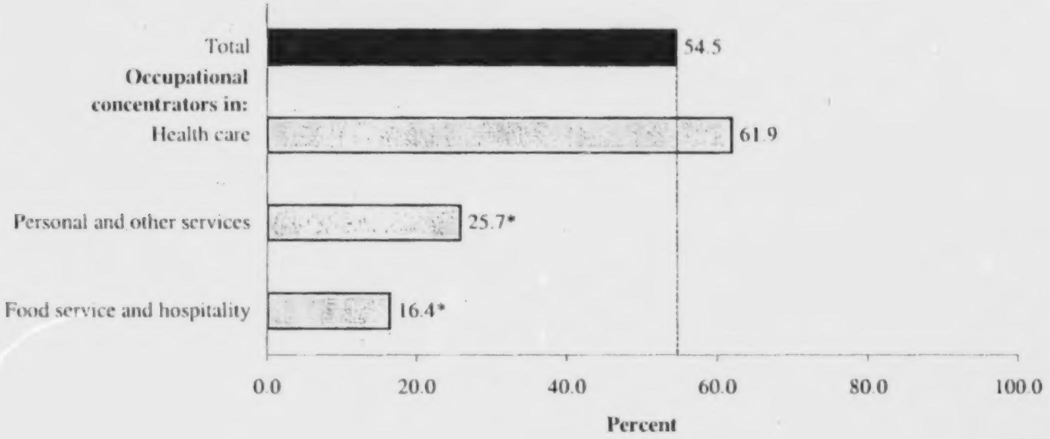
[83] The physics category in the SST contains Principles of Technology, among other courses.

Figure 63. **Percentage of public high school graduates taking regular or advanced chemistry courses, by related occupational concentration area: 1998**

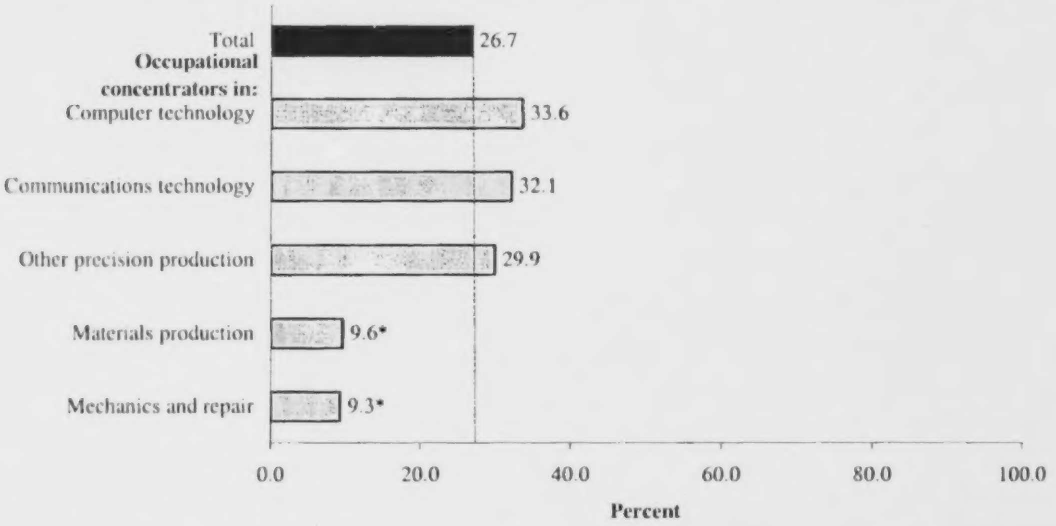


*These program areas were statistically different from the total.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Figure 64. **Percentage of public high school graduates taking physics courses, by related occupational concentration area: 1998**



*These program areas were statistically different from the total.

NOTE: Details are provided for graduates who concentrated (earned 3.0 or more credits) in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Summary of Related Academic Coursetaking

Looking across the academic coursetaking areas, graduates concentrating in construction, mechanics and repair, materials production, food service and hospitality, and personal and other services took all of their identified related academic courses at *below*-average rates. These findings indicate that the programs in which occupational concentrators took related academic courses at below-average rates were generally clustered in the trade and industry and in the occupational home economics-related program areas.[84] At the same time, concentrators in communications technology took some of their identified related academic courses at *above*-average rates.

However, concentrators in most program areas took related academic courses at rates that were not statistically different from the average for all graduates, including concentrators in agriculture, business services, business management, marketing, health care, computer technology, print production, and other precision production.

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[84] As mentioned above, trade and industry programs include construction, mechanics and repair, print production, materials production, other precision production, and transportation. As described in chapter I, occupational home economics-related program areas include food service and hospitality, personal and other services, and child care and education.

References

Alt, M.N., and Bradby, D. (1999). *Procedures Guide for Transcript Studies* (NCES 1999–05). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

Bradby, D., and Hoachlander, E.G. (1999). *1998 Revision of the Secondary School Taxonomy* (NCES 1999–06). U.S. Department of Education. Washington, DC: National Center for Education Statistics Working Paper.

Burkam, D.T. (1998). *English Coursetaking and the NELS:88 Transcript Data.* Ann Arbor, MI: University of Michigan.

Burkam, D.T., Lee, V.E., and Smerdon, B.A. (1997). *Mathematics, Foreign Language, and Science Coursetaking and the NELS:88 Transcript Data.* Ann Arbor, MI: The University of Michigan.

Chen, X., Tuma, J., Daniel, B., and Scott, L.A. (forthcoming). *Trends in High School Academic Coursetaking: Mathematics, Science, English and Foreign Language Course Completion, 1982 to 1998* (NCES 2003–343). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Education Commission of the States. (1990, July). *Clearinghouse Notes.* Denver, CO: Author.

Flanagan, P. (1992). *Raising Standards: State Policies to Improve Academic Preparation for College.* Rockville, MD: Westat.

Gallinelli, J. (1979). Vocational Education Programs at the Secondary Level: A Review of Development and Purpose. In T. Abramson, C.K. Tittle, and L. Cohen (Eds.), *Handbook of Vocational Education Evaluation* (pp. 19–36). Beverly Hills, CA: Sage Publications.

Gifford, A.G., Harde, D., Hoachlander, E.G., Meyer, R.H., and Tuma, J.E. (1989). Course Enrollment Patterns in Public Secondary Schools: 1969 to 1987. A discussion paper for the National Assessment of Vocational Education, U.S. Department of Education.

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Hoachlander, E.G., Kaufman, P., and Levesque, K. (1992). *Vocational Education in the United States: 1969–1990* (NCES 92–669). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office

Hurst, D., and Hudson, L. (2000). *Changes in High School Vocational Coursetaking in a Larger Perspective* (NCES 2001–026). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Ingels, S.J., Dowd, K.L., Taylor, J.R., Bartot, V.H., Frankel, M.R., and Pulliam, P.A. (1995). *Second Follow-up: Transcript Component Data File User's Manual* (NCES 95–377). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Jones, C., Clark, M., Mooney, G., McWilliams, H., Crawford, I., Stephenson, B., and Tourangeau, R. (1983). *High School and Beyond, 1980 Sophomore Cohort, First Follow-up (1982), Data File User's Manual* (NCES 83–214). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Jones, C., Knight, S., Butz, M., Crawford, I., and Stephenson, B. (1984). *High School and Beyond Transcripts Survey (1982), Data File User's Manual* (NCES 84–205). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Legum, S., Caldwell, N., Davis, B., Haynes, J., Hill, T.J., Litavecz, S., Rizzo, L., Rust, K., Vo, N., and Gorman, S. (1998). *The 1994 High School Transcript Study Tabulations: Comparative Data on Credits Earned and Demographics for 1994, 1990, 1987, and 1982 High School Graduates* (revised ed.) (NCES 98–532). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Levesque, K. (forthcoming). *Public High School Graduates Who Participated in Vocational/Technical Education: 1982–1998* (NCES 2003–024). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Levesque, K., Lauen, D., Teitelbaum, P., Alt, M., and Librera, S. (2000). *Vocational Education in the United States: Toward the Year 2000* (NCES 2000–029). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Levesque, K., Premo, M., Emanuel, D., Klein, S., Henke, R., Vergun, R., and Kagehiro, S. (1995). *Vocational Education in the United States: The Early 1990s* (NCES 95–024). U.S.

Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

National Commission on Excellence in Education. (1983). *A Nation at Risk: The Imperative for Educational Reform*. Washington, DC: Author.

Office of Vocational and Adult Education. (2002). *Carl D. Perkins Vocational and Technical Education Act of 1998, Report to Congress on State Performance, Program Year 1999–2000.* U.S. Department of Education, Office of Vocational and Adult Education. Washington, DC: U.S. Government Printing Office.

Powell, A., Cohen, D., and Farrar, E. (1985, October). The Shopping Mall High School: Winners and Losers in the Educational Marketplace. *NASSP Bulletin, 69*(483): 40–51.

Roey, S., Caldwell, N., Rust, K., Blumstein, E., Krenzke, T., Legum, S., Kuhn, J., and Waksberg, M. (2001). *The 1998 High School Transcript Study User's Guide and Technical Report* (NCES 2001–477). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Silverberg, M., Warner, E., Goodwin, D., and Fong, M. (2002). *National Assessment of Vocational Education: Interim Report to Congress.* U.S. Department of Education. Washington, DC: Office of the Under Secretary.

Snyder, T.D. and Hoffman, C.M. (1992). *Digest of Education Statistics 1992* (NCES 92–097). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Snyder, T.D., and Hoffman, C.M. (2001). *Digest of Education Statistics 2000* (NCES 2001–034). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Tuma, J. (1996). *Trends in Participation in Secondary Vocational Education: 1982–1992* (NCES 96–004). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Westat. (1992, April 13). *Classification of Secondary School Courses*. Rockville, MD: Author.

Wolter, K.M. (1985). *Introduction to Variance Estimation*. New York: Springer-Verlag.

Appendix A—Means Tables

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Table A1. Percentage of public high school graduates taking vocational/technical education courses, by vocational/technical curriculum: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	98.2	98.0	97.7	97.2	96.5
Occupational education	88.7	90.6	92.2	90.8	90.7
Family and consumer sciences education	50.2	48.1	45.0	45.1	44.4
General labor market preparation	77.6	68.8	60.0	61.1	58.8

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A2. Percentage of public high school graduates meeting different definitions of participation in vocational/technical education: Various years, 1982–98

	1982	1990	1992	1994	1998
Vocational/technical coursetakers[1]	98.2	98.0	97.7	97.2	96.5
Occupational coursetakers[2]	88.7	90.6	92.2	90.8	90.7
Vocational/technical investors[3]	71.3	63.7	61.9	61.1	61.5
Occupational investors[4]	46.2	43.0	42.2	42.0	43.8
Occupational concentrators[5]	33.7	27.8	24.9	25.4	25.0
Advanced occupational concentrators[6]	24.0	16.1	16.2	14.5	14.4
Advanced occupational concentrators with cooperative education[7]	4.2	4.1	3.9	5.2	4.5

[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in one or more of the following 10 broad occupational program areas, regardless of whether they concentrate their occupational coursetaking in a single program area: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A3. Average number of credits earned in general labor market preparation by public high school graduates, by area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	0.95	0.73	0.62	0.64	0.61
Basic typewriting/keyboarding	0.55	0.45	0.34	0.37	0.29
Industrial arts/technology education, total	0.17	0.11	0.12	0.12	0.12
Industrial arts	0.17	0.10	0.10	0.08	0.04
Technology education	‡	0.01	0.02	0.04	0.08
Career preparation/general work experience	0.23	0.17	0.16	0.15	0.20

‡Reporting standards not met. (Too few cases.).

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A4. Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Grade level					
9	17.0	18.1	19.3	19.7	20.7
10	19.9	18.7	19.7	19.1	19.5
11	28.8	24.9	24.4	23.9	23.6
12	34.4	38.3	36.6	37.3	36.2

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A5. Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	88.7	90.6	92.2	90.8	90.7	2.0
Materials production	20.3	14.9	12.4	9.7	11.6	-8.8
Business management	23.8	18.6	18.9	18.8	16.1	-7.6
Mechanics and repair	13.1	10.1	9.4	8.9	10.0	-3.1
Personal and other services	6.3	5.4	6.6	5.8	4.6	-1.7
Construction	7.3	5.5	5.3	6.5	5.6	-1.6
Other precision production	3.9	4.1	3.1	2.2	3.0	-0.9
Protective services	1.3	0.6	1.4	1.3	1.3	0.0
Child care and education	7.6	5.8	5.8	6.1	7.8	0.1
Agriculture	10.1	9.1	9.7	11.3	10.6	0.5
Transportation	0.5	1.1	1.1	1.3	1.0	0.6
Food service and hospitality	2.3	2.3	2.3	3.1	3.2	1.0
Marketing	9.2	9.3	8.3	10.3	10.5	1.3
Print production	19.2	18.7	19.0	17.5	20.5	1.3
Other technology	1.2	0.9	2.4	1.2	2.7	1.5
Health care	4.5	2.8	4.0	4.6	6.7	2.1
Business services	42.1	46.9	47.3	51.4	44.4	2.3
Communications technology	10.8	9.7	9.7	10.6	15.1	4.4
Computer technology	13.2	38.6	44.6	28.7	34.3	21.1

NOTE: Rows sum to greater than the total because graduates may have taken courses in more than one program area. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A6. Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	3.03	2.89	2.84	2.79	2.87	-0.16
Business services	0.79	0.72	0.65	0.71	0.56	-0.23
Materials production	0.34	0.23	0.19	0.14	0.17	-0.17
Mechanics and repair	0.26	0.20	0.18	0.15	0.17	-0.09
Business management	0.22	0.16	0.18	0.17	0.14	-0.08
Construction	0.13	0.10	0.12	0.10	0.10	-0.03
Personal and other services	0.10	0.10	0.11	0.09	0.07	-0.03
Other precision production	0.05	0.06	0.04	0.02	0.04	-0.01
Agriculture	0.21	0.20	0.19	0.24	0.20	-0.01
Marketing	0.16	0.16	0.13	0.18	0.16	0.00
Protective services	0.01	0.00	0.01	0.01	0.01	0.00
Transportation	0.01	0.01	0.01	0.01	0.01	0.00
Print production	0.26	0.25	0.26	0.23	0.27	0.01
Other technology	0.01	0.01	0.03	0.01	0.03	0.02
Food service and hospitality	0.03	0.04	0.03	0.04	0.05	0.02
Child care and education	0.07	0.06	0.06	0.08	0.10	0.03
Communications technology	0.08	0.09	0.10	0.10	0.16	0.08
Health care	0.05	0.04	0.06	0.08	0.14	0.09
Computer technology	0.11	0.30	0.37	0.23	0.31	0.20

NOTE: Detail may not sum to totals because of rounding and because a small number of occupational courses recorded on the transcripts did not specify an occupational program area with which they were associated. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A7. Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	33.7	27.8	24.9	25.4	25.0	-8.7
Business services	9.3	6.5	4.8	5.4	3.3	-6.0
Materials production	3.0	1.8	1.5	1.1	1.3	-1.7
Mechanics and repair	3.0	2.3	1.9	1.6	1.8	-1.2
Personal and other services	1.3	1.3	1.3	1.1	0.8	-0.5
Construction	1.5	1.1	1.2	1.0	1.3	-0.2
Agriculture	2.8	2.5	2.3	3.2	2.6	-0.2
Other precision production	0.4	0.4	0.2	0.2	0.2	-0.2
Print production	2.0	1.8	2.2	1.8	2.0	0.0
Marketing	1.8	2.1	1.3	2.2	1.8	0.0
Transportation	‡	0.1	#	0.1	0.1	†
Protective services	‡	‡	0.1	0.1	0.1	†
Other technology	0.1	‡	0.2	0.0	0.2	0.1
Food service and hospitality	0.2	0.5	0.4	0.4	0.5	0.2
Business management	0.2	0.2	0.3	0.3	0.4	0.3
Computer technology	0.3	0.3	0.4	0.3	0.6	0.4
Child care and education	0.2	0.3	0.4	0.6	0.6	0.4
Communications technology	0.1	0.3	0.3	0.3	0.8	0.7
Health care	0.6	0.6	0.6	1.0	1.9	1.3
Mixed programs						
Business	2.1	1.8	2.4	2.0	1.2	1.0
Precision production	2.5	1.9	1.3	1.1	1.4	1.2
Trade and industry	2.3	1.8	1.8	1.6	1.8	-0.5
Technology	‡	0.2	0.4	0.2	0.6	†

†Not applicable.

#Rounds to zero.

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the 18 narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A8. Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	38.0	30.6	27.1	28.0	27.6	-10.4
Business services	22.1	13.9	10.2	10.5	7.4	-14.7
Mechanics and repair	23.3	22.7	19.8	18.4	18.1	-5.2
Materials production	15.0	12.1	11.8	11.7	11.4	-3.5
Agriculture	27.2	27.9	23.5	28.1	24.0	-3.2
Personal and other services	20.4	23.8	19.9	18.8	17.3	-3.0
Other precision production	10.5	9.6	6.0	6.6	7.7	-2.8
Marketing	19.2	22.6	15.4	21.0	17.2	-2.1
Other technology	6.3	4.2	7.0	3.3	5.5	-0.8
Print production	10.3	9.6	11.4	10.1	9.7	-0.7
Transportation	7.0	8.8	1.9	6.0	6.5	-0.5
Computer technology	1.9	0.8	0.9	0.9	1.9	-0.1
Construction	20.6	20.2	22.8	15.7	22.4	1.9
Business management	0.6	0.9	1.5	1.6	2.6	1.9
Protective services	2.3	‡	4.9	3.8	5.2	2.9
Food service and hospitality	10.8	20.2	16.5	11.5	14.2	3.4
Communications technology	1.1	2.8	2.7	3.2	5.6	4.5
Child care and education	2.5	4.9	6.0	9.3	7.6	5.0
Health care	13.0	20.4	15.6	21.1	28.0	15.0

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational coursetakers earned greater than 0.0 occupational credits. Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on occupational coursetakers who earned 3.0 or more credits in the narrow program areas in which they took courses. Rows sum to greater than the total because occupational coursetakers took courses in more than one program area. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A9. Percentage distribution of occupational concentrators, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Transportation	0.1	0.3	0.1	0.3	0.3
Protective services	0.1	‡	0.3	0.2	0.3
Other technology	0.2	0.1	0.7	0.2	0.6
Other precision production	1.2	1.4	0.7	0.6	0.9
Business management	0.4	0.6	1.1	1.2	1.7
Food service and hospitality	0.7	1.7	1.5	1.4	1.8
Child care and education	0.6	1.0	1.4	2.2	2.4
Computer technology	0.8	1.0	1.6	1.0	2.5
Personal and other services	3.8	4.6	5.3	4.3	3.2
Communications technology	0.4	1.0	1.1	1.3	3.4
Construction	4.4	4.0	4.8	4.0	5.1
Materials production	9.0	6.5	5.8	4.5	5.3
Marketing	5.3	7.6	5.1	8.5	7.2
Mechanics and repair	9.0	8.3	7.5	6.4	7.2
Health care	1.8	2.0	2.5	3.8	7.4
Print production	5.9	6.4	8.7	7.0	7.9
Agriculture	8.2	9.2	9.2	12.5	10.2
Business services	27.6	23.5	19.4	21.2	13.1
Mixed programs					
Technology	‡	0.8	1.7	0.9	2.4
Business	6.3	6.3	9.5	7.8	4.6
Precision production	7.5	7.0	5.2	4.4	5.5
Trade and industry	6.7	6.6	7.1	6.4	7.0

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A10. Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by various concentration definitions: Various years, 1982–98

	1982	1990	1992	1994	1998
Occupational concentrators[1]	72.8	64.6	59.1	60.6	57.0
Advanced occupational concentrators[2]	52.0	37.5	38.4	34.6	32.9
Advanced occupational concentrators with cooperative education[3]	9.1	9.5	9.3	12.3	10.3

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[3] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A11. Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	72.8	64.6	59.1	60.6	57.0	-15.8
Business services	20.1	15.2	11.4	12.8	7.5	-12.6
Materials production	6.6	4.2	3.5	2.7	3.0	-3.6
Mechanics and repair	6.6	5.3	4.4	3.9	4.1	-2.5
Personal and other services	2.8	3.0	3.1	2.6	1.8	-0.9
Other precision production	0.9	0.9	0.4	0.4	0.5	-0.4
Construction	3.2	2.6	2.9	2.5	2.9	-0.4
Agriculture	6.0	5.9	5.4	7.6	5.8	-0.1
Transportation	0.1	0.2	0.1	0.2	0.2	0.1
Protective services	0.1	‡	0.2	0.1	0.2	0.1
Other technology	0.2	0.1	0.4	0.1	0.3	0.2
Print production	4.3	4.2	5.1	4.2	4.5	0.2
Marketing	3.8	4.9	3.0	5.1	4.1	0.3
Food service and hospitality	0.5	1.1	0.9	0.9	1.0	0.5
Business management	0.3	0.4	0.7	0.7	0.9	0.6
Computer technology	0.6	0.7	1.0	0.6	1.5	0.9
Child care and education	0.4	0.7	0.8	1.4	1.3	0.9
Communications technology	0.3	0.6	0.6	0.8	1.9	1.7
Health care	1.3	1.3	1.5	2.3	4.2	3.0
Mixed programs						
Precision production	5.5	4.5	3.1	2.6	3.1	-2.3
Business	4.6	4.1	5.6	4.7	2.6	-1.9
Trade and industry	4.9	4.3	4.2	3.9	4.0	-0.9
Technology	‡	0.6	1.0	0.5	1.4	†

†Not applicable.

‡Reporting standards not met. (Too few cases.).

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A12. Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	100.0	100.0	100.0	100.0	100.0	0.0
Business services	26.7	25.0	22.8	24.4	18.8	-7.9
Materials production	11.3	8.2	7.2	5.2	6.0	-5.2
Mechanics and repair	8.7	6.8	6.2	5.6	6.3	-2.5
Business management	6.9	5.2	6.2	6.0	4.8	-2.0
Personal and other services	3.4	3.5	3.9	3.3	2.6	-0.9
Construction	4.3	3.4	3.7	3.8	3.6	-0.7
Other precision production	1.8	2.0	1.4	0.9	1.2	-0.6
Marketing	6.1	6.5	5.3	7.3	6.3	0.2
Protective services	0.3	0.1	0.4	0.3	0.5	0.2
Transportation	0.2	0.4	0.4	0.5	0.4	0.2
Agriculture	7.2	7.2	7.6	9.2	7.6	0.4
Print production	9.1	9.2	9.9	8.6	9.6	0.6
Other technology	0.4	0.3	1.0	0.4	1.1	0.7
Food service and hospitality	1.0	1.4	1.3	1.6	1.8	0.8
Child care and education	2.2	2.0	1.9	2.9	3.3	1.1
Communications technology	2.2	2.9	3.1	3.4	5.7	3.4
Health care	1.6	1.6	2.2	3.2	5.1	3.5
Computer technology	2.9	8.2	10.5	6.5	9.0	6.2

NOTE: Detail may not sum to totals because of rounding and because a small number of occupational courses recorded on the transcripts did not specify an occupational program area with which they were associated. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A13. Average number of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	4.76	4.60	4.57	4.40	4.39	-0.37
Course level						
First	2.76	2.91	2.54	2.61	2.63	-0.13
Second or higher	1.42	1.01	1.15	0.85	0.88	-0.54
Specialty	0.29	0.29	0.45	0.37	0.38	0.09
Cooperative education	0.29	0.39	0.43	0.57	0.51	0.22

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A14. Percentage distribution of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98

	1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	100.0	100.0	100.0	100.0	100.0	0.0
Course level						
First	58.6	63.4	57.2	59.4	59.6	1.0
Second or higher	28.3	20.9	23.6	18.2	19.5	-8.7
Specialty	6.5	6.8	10.1	8.8	9.4	2.9
Cooperative education	6.7	8.8	9.2	13.6	11.5	4.8

NOTE: Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A15. Percentage of total occupational credits earned by occupational coursetakers that were cooperative education credits: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	6.3	6.8	6.2	8.6	8.5

NOTE: Occupational coursetakers earned greater then 0.0 credits in occupational education.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A16. Average number of computer-related credits earned by public high school graduates, by vocational/technical curriculum and subarea: Various years, 1982–98

	1982[1]	1990	1992	1994	1998
Total	†	1.04	1.03	1.04	1.05
General labor market preparation, total	†	0.45	0.34	0.40	0.35
Basic typewriting/keyboarding	†	0.45	0.34	0.37	0.29
Technology education[2]	‡	‡	‡	0.03	0.06
Occupational education, total	0.12	0.59	0.68	0.64	0.70
Business services[2]	0.01	0.28	0.29	0.38	0.33
Drafting[2]	‡	0.01	0.02	0.03	0.06
Computer technology, total	0.11	0.30	0.37	0.23	0.31
Computer applications	‡	0.05	0.03	0.07	0.16
Computer programming	0.04	0.13	0.09	0.05	0.04
Data processing	0.04	0.01	0.03	0.01	0.01
Computer science and systems	0.01	0.10	0.20	0.08	0.09
Computer mathematics	0.02	0.02	0.02	0.02	0.01

†Not applicable.

‡Reporting standards not met. (Too few cases.).

[1] In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total general labor market preparation and total computer-related courses are not comparable with other years.

[2] Only a subset of courses in the technology education, business services, and drafting areas were considered to be computer-related. See figure 33.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A17. Percentage distribution of computer-related credits earned by public high school graduates, by vocational/technical curriculum and computer-related area: Various years, 1982–98

	1982[1]	1990	1992	1994	1998
Total	†	100.00	100.00	100.00	100.00
General labor market preparation, total	†	47.97	35.95	42.04	38.29
Basic typewriting/keyboarding	†	47.97	35.96	39.91	33.48
Technology education	†	‡	‡	2.13	4.81
Occupational education, total	†	52.03	64.05	57.97	61.71
Business services	†	22.24	27.03	34.26	30.49
Drafting	†	0.99	1.49	1.83	4.06
Computer technology, total	†	28.79	35.49	21.87	27.16
Computer applications	†	3.87	2.78	6.46	12.51
Computer programming	†	10.92	7.19	4.43	3.08
Data processing	†	0.72	2.32	0.40	0.65
Computer science and systems	†	11.24	21.12	9.22	9.88
Computer mathematics	†	2.04	2.08	1.38	1.04

†Not applicable.

‡Reporting standards not met. (Too few cases.)

[1] In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A18. Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98

	1982[1]	1990	1992	1994	1998
General labor market preparation, total	†	100.0	100.0	100.0	100.0
Noncomputer-related	†	27.9	34.6	26.8	31.5
Computer-related, total	†	72.1	65.4	73.2	68.5
Basic typewriting/keyboarding	†	72.1	65.4	70.1	60.4
Technology education	†	‡	‡	3.0	8.1
Occupational education, total	100.0	100.0	100.0	100.0	100.0
Noncomputer-related	93.7	69.2	65.3	66.1	66.7
Computer-related, total	6.3	30.8	34.7	33.9	33.3
Business services	0.4	12.7	14.1	19.9	15.9
Drafting	‡	0.5	0.7	0.9	2.0
Computer technology, total	6.0	17.7	19.8	13.1	15.4
Computer applications	0.2	2.4	1.6	4.0	7.1
Computer programming	2.3	7.0	4.3	2.8	2.0
Data processing	1.3	0.5	1.3	0.2	0.3
Computer science and systems	0.8	6.3	11.2	5.2	5.3
Computer mathematics	1.4	1.5	1.4	0.9	0.7

†Not applicable.

‡Reporting standards not met. (Too few cases.).

[1] In 1982, all basic typewriting/keyboarding courses were assumed not to be computer-related, while in subsequent years all of these courses were classified as computer-related. Therefore, 1982 estimates for basic typewriting/keyboarding, total computer-related general labor market preparation and total noncomputer-related general labor market preparation courses are not comparable with other years.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A19. Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced mathematics[1]	22.6	28.7	34.0	36.3	38.3
Upper-middle mathematics[2]	17.2	25.7	26.3	26.8	28.9
Lower-middle mathematics[3]	30.9	26.5	24.6	23.4	21.7
Low mathematics[4]	29.4	19.2	15.1	13.5	11.2
Occupational concentrators[5]	100.0	100.0	100.0	100.0	100.0
Advanced mathematics	9.3	11.4	17.7	18.5	26.0
Upper-middle mathematics	13.3	20.1	21.6	25.0	28.3
Lower-middle mathematics	36.1	34.9	32.2	32.6	28.6
Low mathematics	41.3	33.6	28.4	24.0	17.2
Nonconcentrators[6]	100.0	100.0	100.0	100.0	100.0
Advanced mathematics	29.3	35.3	39.4	42.3	42.4
Upper-middle mathematics	19.2	27.8	27.9	27.4	29.0
Lower-middle mathematics	28.2	23.3	22.0	20.3	19.3
Low mathematics	23.3	13.6	10.7	9.9	9.2

[1] Includes algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and calculus.

[2] Includes algebra 2 and unified mathematics 3, but no higher mathematics.

[3] Includes algebra 1, plane and solid geometry, and unified mathematics 1 and 2, but no higher mathematics.

[4] Includes no mathematics; remedial-level mathematics; general, basic or consumer mathematics; technical or vocational mathematics; and low-level "academic" mathematics, such as pre-algebra, algebra 1 taught over the course of two academic years, and informal geometry; but no mathematics in higher categories.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A20. Percentage distribution of public high school graduates according to level of science coursetaking achieved, by occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced science[1]	27.7	45.5	47.8	51.8	57.2
Biology[2]	40.5	40.1	40.5	37.0	31.9
Low science[3]	31.9	14.4	11.7	11.3	10.9
Occupational concentrators[4]	100.0	100.0	100.0	100.0	100.0
Advanced science	12.8	21.2	27.0	30.0	42.0
Biology	43.0	55.3	53.6	52.1	41.0
Low science	44.2	23.5	19.5	18.0	17.1
Nonconcentrators[5]	100.0	100.0	100.0	100.0	100.0
Advanced science	35.2	54.8	54.8	59.2	62.2
Biology	39.2	34.3	36.1	31.8	28.9
Low science	25.6	10.9	9.1	9.0	8.9

[1] Includes chemistry 1 and 2 and physics 1 and 2.

[2] Includes general biology 1, secondary life sciences (including ecology, zoology, marine biology, and human physiology), general or honors biology 2, and advanced biology, but no higher science.

[3] Includes no science courses, remedial-level science, physical science, earth science, unified science, astronomy, geology, environmental science, oceanography, general physics, basic biology 1, and consumer or introductory chemistry, but no higher science.

[4] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[5] All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A21. Percentage distribution of public high school graduates according to level of English coursetaking achieved, by occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
Advanced English[1]	12.1	19.0	22.8	23.8	24.3
Middle English[2]	76.5	60.6	57.8	58.2	60.8
Low English[3]	11.5	20.4	19.4	18.1	14.8
Occupational concentrators[4]	100.0	100.0	100.0	100.0	100.0
Advanced English	6.7	8.3	12.5	12.8	17.0
Middle English	79.6	64.9	60.6	65.1	63.8
Low English	13.8	26.8	26.9	22.1	19.3
Nonconcentrators[5]	100.0	100.0	100.0	100.0	100.0
Advanced English	14.8	23.0	26.1	27.5	26.8
Middle English	74.9	59.0	56.9	55.8	59.9
Low English	10.3	18.0	17.0	16.7	13.4

[1] Includes at least some English coursework in honors courses.

[2] Includes no honors and no low-level English coursework.

[3] Includes at least some English coursework in low-level courses.

[4] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[5] All graduates except occupational concentrators.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A22. Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Biology, chemistry, or physics, total	83.0	94.5	95.7	97.2	95.6
Biology	79.3	92.9	94.0	95.7	94.1
Chemistry	31.4	49.7	53.8	57.4	61.3
Physics	16.7	23.1	25.1	27.4	30.2
Occupational concentrators[1]					
Biology, chemistry, or physics, total	73.0	90.2	91.5	95.1	92.5
Biology	68.9	88.2	90.3	93.5	90.3
Chemistry	15.0	24.6	31.5	34.6	46.5
Physics	7.8	9.7	13.4	13.0	21.4
Nonconcentrators[2]					
Biology, chemistry, or physics, total	88.0	96.1	97.0	97.8	96.6
Biology	84.6	94.7	95.3	96.5	95.4
Chemistry	39.8	59.4	61.3	65.1	66.2
Physics	21.3	28.3	29.0	32.3	33.1

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] All graduates except occupational concentrators.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A23. Percentage of public high school graduates completing U.S. or world history courses, by type of course and occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	91.8	96.9	96.1	97.9	95.5
U.S. history	86.9	95.4	92.7	96.3	94.0
World history	42.5	57.6	64.5	65.3	65.0
Occupational concentrators[1]	90.4	96.9	94.7	98.2	95.7
U.S. history	86.7	96.0	91.1	96.6	94.1
World history	36.3	49.9	56.8	59.2	60.5
Nonconcentrators[2]	92.5	96.9	96.6	97.8	95.5
U.S. history	87.0	95.1	93.3	96.2	94.0
World history	45.6	60.6	67.1	67.4	66.5

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] All graduates except occupational concentrators.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A24. Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	8.7	28.7	32.0	36.7	38.9
Vocational/technical participation measures					
Vocational/technical coursetakers[1]	8.3	28.1	31.4	35.9	38.2
Occupational coursetakers[2]	6.8	27.0	30.4	35.1	37.3
Vocational/technical investors[3]	3.0	17.3	20.0	24.4	30.1
Occupational investors[4]	2.2	13.5	17.8	21.6	28.6
Occupational concentrators[5]	1.7	10.1	13.5	17.9	25.9
Advanced occupational concentrators[6]	1.4	10.9	14.0	18.4	26.7
Advanced occupational concentrators with cooperative education[7]	1.1	9.7	18.8	16.2	33.7
Vocational/technical nonparticipation measures					
All graduates except vocational/technical coursetakers	32.5	59.9	60.1	63.6	57.7
All graduates except occupational coursetakers	23.4	45.4	51.7	53.1	54.3
All graduates except vocational/technical investors	22.9	48.8	51.6	56.0	52.9
All graduates except occupational investors	14.3	40.1	42.4	47.7	46.9
All graduates except occupational concentrators	12.2	35.9	38.2	43.1	43.2
All graduates except advanced occcupational concentrators	11.0	32.1	35.5	39.8	40.9
All graduates except advanced occupational concentrators with cooperative education	9.0	29.5	32.6	37.8	39.1

[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A25. Percentage distribution of public high school graduates according to college-preparatory and occupational concentration status: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	100.0	100.0	100.0	100.0	100.0
College-preparatory only	8.1	25.9	28.7	32.2	32.4
Occupational concentration only	33.1	25.0	21.6	20.9	18.5
Both college-preparatory and occupational concentration	0.6	2.8	3.4	4.5	6.5
Neither college-preparatory nor occupational concentration	58.2	46.3	46.4	42.4	42.6

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. An occupational concentration is defined as earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A26. Percentage of occupational concentrators and nonconcentrators completing college-preparatory coursework, by subject: Various years, 1982–98

	1982	1990	1992	1994	1998
Occupational concentrators[1]					
College-preparatory, total	1.7	10.1	13.5	17.9	25.9
English	57.7	78.7	82.1	88.7	82.0
Mathematics	13.7	24.7	30.5	37.3	48.1
Science	16.5	30.8	38.6	43.2	54.8
Social studies	81.6	92.2	91.8	96.5	93.1
Foreign languages	10.1	23.9	27.5	32.5	42.0
Nonconcentrators[2]					
College-preparatory, total	12.2	35.9	38.2	43.1	43.2
English	65.5	85.5	86.6	88.6	85.8
Mathematics	37.4	56.3	58.3	62.9	66.0
Science	43.2	64.4	66.3	71.1	73.4
Social studies	85.7	93.9	94.2	96.7	92.9
Foreign languages	37.1	59.5	62.2	64.9	67.1

[1] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[2] All graduates except occupational concentrators.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A27. Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: Various years, 1982–98

	1982	1990	1992	1994	1998
Vocational/technical, total	4.68	4.19	3.99	3.96	3.99
College-preparatory	1.99	2.51	2.57	2.59	3.03
Not college-preparatory	4.93	4.87	4.66	4.75	4.60
Occupational education	3.03	2.89	2.84	2.79	2.87
College-preparatory	1.13	1.70	1.85	1.83	2.19
Not college-preparatory	3.21	3.37	3.30	3.35	3.30
General labor market preparation	0.95	0.73	0.62	0.64	0.61
College-preparatory	0.64	0.54	0.43	0.45	0.46
Not college-preparatory	0.98	0.81	0.70	0.75	0.70
Family and consumer sciences education	0.69	0.57	0.54	0.52	0.51
College-preparatory	0.22	0.28	0.29	0.31	0.37
Not college-preparatory	0.74	0.69	0.65	0.65	0.60

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A28. Percentage of public high school graduates meeting selected definitions of participation in vocational/technical education, by college-preparatory coursework status: 1998

	College-preparatory	Not college-preparatory
Total	100.0	100.0
Vocational/technical coursetakers[1]	94.8	97.6
Occupational coursetakers[2]	86.9	93.0
Vocational/technical investors[3]	47.6	70.4
Occupational investors[4]	32.3	51.2
Occupational concentrators[5]	16.7	30.3
Advanced occupational concentrators[6]	7.7	15.2
Advanced occupational concentrators with cooperative education[7]	4.0	4.9

[1] Graduates earning greater than 0.0 credits in vocational/technical education.

[2] Graduates earning greater than 0.0 credits in occupational education.

[3] Graduates earning 3.0 or more credits in vocational/technical education.

[4] Graduates earning 3.0 or more credits in occupational education, regardless of whether they concentrate their occupational coursetaking in a single program area.

[5] Graduates earning 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services.

[6] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 advanced credit in that program area. Advanced occupational coursework includes second- or higher-level courses and cooperative education courses.

[7] Graduates earning 3.0 or more credits in one of the 10 broad occupational program areas, with at least 1.0 cooperative education credit in that program area.

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table A29. Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998

	College-preparatory	Not college-preparatory	Difference
Total	16.7	30.3	-13.6
Health care	2.3	1.6	0.8
Communications technology	1.3	0.6	0.7
Business services	3.5	3.1	0.4
Computer technology	0.6	0.7	0.0
Transportation	0.0	0.1	-0.1
Other precision production	0.2	0.3	-0.1
Business management	0.4	0.4	-0.1
Other technology	0.1	0.2	-0.1
Child care and education	0.3	0.7	-0.4
Food service and hospitality	0.1	0.7	-0.6
Personal and other services	0.3	1.1	-0.8
Marketing	1.2	2.2	-0.9
Print production	1.3	2.4	-1.1
Construction	0.3	1.9	-1.7
Agriculture	1.5	3.2	-1.7
Mechanics and repair	0.4	2.7	-2.3
Protective services	‡	0.1	†
Materials production	‡	‡	†
Mixed programs			
Business	1.0	1.2	-0.2
Precision production	0.5	1.9	-1.4
Trade and industry	0.3	2.7	-2.3
Technology	0.7	0.6	0.1

†Not applicable.

‡Reporting standards not met. (Too few cases.).

NOTE: College-preparatory coursework is defined as earning 4.0 or more credits in English; 3.0 or more credits in mathematics at the algebra 1 or higher level; 2.0 or more credits in biology, chemistry, or physics; 2.0 or more credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 or more credits in a single foreign language. Occupational concentrators (the "total" row) earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on the narrow program areas in which graduates earned 3.0 or more credits. "Mixed" categories include students who earned 3.0 or more credits in one of the 10 broad occupational program areas, but fewer than 3.0 credits in any one of the associated sub-areas. Detail may not sum to totals because of rounding. Calculations are based on unrounded numbers.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table A30. Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	72.8	83.1	86.8	88.4	91.6
Nonconcentrators[1]	78.6	88.3	90.9	91.7	93.2
Concentrators, total[2]	61.2	69.5	74.2	78.8	87.1
Agriculture	52.2	60.7	62.5	78.5	87.3
Business management	‡	‡	87.1	72.6	92.1
Business services	69.4	80.1	87.2	84.7	91.4
Child care and education	‡	65.1	55.2	72.1	92.8
Communications technology	‡	95.8	91.9	89.6	99.1
Computer technology	‡	86.3	88.9	92.7	93.4
Construction	38.9	51.0	58.2	60.5	71.6
Food service and hospitality	‡	36.9	37.1	42.4	75.4
Health care	50.7	66.6	68.6	86.7	92.3
Marketing	71.4	77.5	70.8	85.9	92.8
Materials production	53.0	49.4	51.7	57.3	79.9
Mechanics and repair	48.3	50.1	53.5	62.6	76.4
Other precision production	59.3	62.4	‡	73.0	88.8
Other technology	‡	‡	‡	‡	‡
Personal and other services	61.9	56.6	70.7	74.2	83.2
Print production	71.2	85.6	89.8	90.3	91.3
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

[1] All graduates except occupational concentrators.

[2] Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A31. Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	45.5	61.5	65.4	68.6	70.8
Nonconcentrators[1]	54.0	68.9	71.5	73.9	72.9
Concentrators, total[2]	28.7	42.2	47.1	53.2	64.3
Agriculture	21.8	32.0	40.5	53.9	61.3
Business management	‡	‡	62.4	59.3	68.0
Business services	33.1	50.4	58.7	59.0	73.5
Child care and education	‡	25.3	40.9	46.1	64.6
Communications technology	‡	82.2	85.1	75.7	86.8
Computer technology	‡	68.5	56.9	73.3	70.6
Construction	12.2	19.6	23.8	30.1	46.3
Food service and hospitality	‡	25.2	21.4	16.3	45.1
Health care	21.4	30.0	27.5	56.2	79.3
Marketing	29.9	52.9	51.2	61.7	69.9
Materials production	20.0	22.2	25.4	34.5	46.5
Mechanics and repair	14.0	22.4	24.4	32.3	44.4
Other precision production	30.8	40.6	‡	47.1	62.4
Other technology	‡	‡	‡	‡	‡
Personal and other services	18.3	29.8	26.4	47.4	59.1
Print production	46.6	61.9	63.4	63.2	72.7
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

[1] All graduates except occupational concentrators.

[2] Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A32. Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	61.3	83.0	86.1	86.5	87.2
Nonconcentrators[1]	66.1	86.2	88.4	88.5	89.4
Concentrators, total[2]	51.8	74.6	78.9	80.5	80.6
Agriculture	52.4	75.6	81.8	86.6	84.7
Business management	‡	‡	83.7	82.9	85.1
Business services	56.2	78.4	87.3	84.9	84.8
Child care and education	‡	74.7	72.3	77.5	91.6
Communications technology	‡	95.8	94.4	88.3	94.6
Computer technology	‡	88.4	92.8	78.1	82.9
Construction	44.1	63.7	66.0	73.3	64.8
Food service and hospitality	‡	54.8	53.3	55.2	59.2
Health care	54.4	75.0	76.0	85.1	89.1
Marketing	60.1	82.4	87.2	83.7	89.0
Materials production	49.3	56.1	62.2	67.2	67.6
Mechanics and repair	42.9	68.3	63.6	64.2	68.0
Other precision production	48.3	54.7	‡	83.9	76.0
Other technology	‡	‡	‡	‡	‡
Personal and other services	49.2	70.0	78.6	75.9	74.7
Print production	61.9	79.3	77.4	85.1	80.6
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

[1] All graduates except occupational concentrators.

[2] Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A33. Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	25.5	43.1	45.6	48.5	54.5
Nonconcentrators[1]	32.6	52.0	52.6	55.6	59.4
Concentrators, total[2]	11.7	20.0	24.4	27.7	39.6
Agriculture	13.2	16.9	28.0	27.9	39.8
Business management	‡	‡	31.9	26.9	45.2
Business services	11.5	25.1	30.4	35.3	47.3
Child care and education	‡	9.7	16.6	24.9	28.4
Communications technology	‡	40.0	54.9	47.2	70.8
Computer technology	‡	49.9	45.6	39.5	62.4
Construction	3.7	8.8	11.8	15.9	20.0
Food service and hospitality	‡	‡	6.7	3.3	16.4
Health care	13.1	27.2	25.7	33.4	61.9
Marketing	9.2	21.8	22.0	26.7	46.8
Materials production	9.1	8.8	10.7	12.2	16.7
Mechanics and repair	3.0	6.3	5.3	11.7	21.2
Other precision production	13.5	12.4	‡	12.5	63.2
Other technology	‡	‡	‡	‡	‡
Personal and other services	5.6	7.3	15.4	12.3	25.7
Print production	24.7	29.8	30.4	38.5	40.3
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

[1] All graduates except occupational concentrators.

[2] Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992, and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table A34. Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98

	1982	1990	1992	1994	1998
Total	13.9	20.5	21.3	23.8	26.7
Nonconcentrators[1]	17.9	25.6	24.7	28.4	29.7
Concentrators, total[2]	6.1	7.4	11.0	10.3	17.7
Agriculture	8.5	7.0	5.9	8.2	13.9
Business management	‡	‡	‡	2.9	11.0
Business services	3.1	6.2	12.5	9.8	18.7
Child care and education	‡	‡	‡	5.2	13.3
Communications technology	‡	19.4	18.4	21.9	32.1
Computer technology	‡	34.3	37.7	31.0	33.6
Construction	4.0	1.5	3.9	1.3	6.7
Food service and hospitality	‡	‡	‡	3.4	4.5
Health care	4.6	‡	‡	10.7	33.2
Marketing	2.4	2.6	6.5	6.9	10.7
Materials production	7.9	4.5	12.0	8.4	9.6
Mechanics and repair	5.7	2.6	7.5	2.2	9.3
Other precision production	‡	17.8	‡	‡	29.9
Other technology	‡	‡	‡	‡	‡
Personal and other services	2.2	2.5	‡	1.8	8.5
Print production	12.9	16.6	18.1	22.6	30.2
Protective services	‡	‡	‡	‡	‡
Transportation	‡	‡	‡	‡	‡

‡Reporting standards not met. (Too few cases.).

[1] All graduates except occupational concentrators.

[2] Occupational concentrators earned 3.0 or more credits in one of the following 10 broad occupational program areas: agriculture, business, marketing, health care, protective services, technology, trade and industry, food service and hospitality, child care and education, and personal and other services. Detail is provided on graduates who earned 3.0 or more credits in the narrow program areas listed.

SOURCE: U.S. Department of Education, National Center for Education Statistics. High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Appendix B—Standard Error Tables

Table B1. Standard errors for figure 2: Average number of credits completed by public high school graduates, by type of coursework: 1998

		English	Vocational/ technical	Social studies	Mathematics	Science	Fine arts	Foreign languages
Total	s.e.	0.037	0.098	0.038	0.024	0.026	0.079	0.039
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617	2,617	2,617	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table B2. Standard errors for figures 6 and 8: Average number of credits earned by public high school graduates, by curriculum: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.080	0.127	0.094	0.144	0.162
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Academic	s.e.	0.074	0.116	0.094	0.092	0.127
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical		0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Enrichment/other	s.e.	0.037	0.073	0.035	0.077	0.077
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B3. Standard errors for figure 7: Percentage distribution of total credits earned by public high school graduates, by curriculum: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Academic	s.e.	0.26	0.40	0.27	0.28	0.44
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical	s.e.	0.24	0.32	0.24	0.27	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Enrichment/other	s.e.	0.15	0.28	0.14	0.27	0.28
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B4. Standard errors for figure 9: Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Family and consumer sciences education	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998

Table B5. Standard errors for figure 12: Percentage distribution of vocational/technical credits earned by public high school graduates, by vocational/technical curriculum: Various years, 1982–98

		Total	Occupational education	General labor market preparation	Family and consumer sciences education
1982	s.e.	†	0.50	0.43	0.35
	weighted n (in 1,000s)	2,559	2,559	2,559	2,559
1990	s.e.	†	0.88	0.63	0.57
	weighted n (in 1,000s)	2,454	2,454	2,454	2,454
1992	s.e.	†	0.62	0.51	0.46
	weighted n (in 1,000s)	2,125	2,125	2,125	2,125
1994	s.e.	†	0.85	0.63	0.70
	weighted n (in 1,000s)	2,150	2,150	2,150	2,150
1998	s.e.	†	1.02	0.77	0.80
	weighted n (in 1,000s)	2,526	2,526	2,526	2,526

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B6. Standard errors for figure 13: Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: 1998

		Vocational/ technical total	General labor market preparation	Family and consumer sciences education	Occupational education
Total	s.e.	†	†	†	†
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
Grade level					
9	s.e.	0.72	2.53	1.52	0.74
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
10	s.e.	0.54	1.57	1.14	0.60
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
11	s.e.	0.50	1.03	0.90	0.60
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372
12	s.e.	0.61	1.28	1.63	0.64
	weighted n (in 1,000s)	2,526	1,539	1,160	2,372

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table B7. Standard errors for figure 14: Average number of occupational credits earned by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.011	0.015	0.012	0.013	0.020
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.015	0.016	0.015	0.015	0.017
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.021	0.025	0.019	0.019	0.025
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.021	0.034	0.025	0.027	0.038
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B8. Standard errors for figure 24: Percentage of occupational concentrators completing advanced coursework in their area of concentration: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	1.23	1.90	1.59	1.76	2.52
	weighted n (in 1,000s)	878.00	696.00	542.00	562.00	654.00

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B9. Standard errors for figure 29: Percentage of public high school graduates taking work-based learning, by type of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.93	1.48	1.14	1.53	2.10
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Cooperative education	s.e.	0.61	1.22	0.68	0.83	1.21
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General work experience	s.e.	0.85	1.38	1.07	1.56	2.03
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B10. Standard errors for figure 30: Average number of credits earned in work-based learning by public high school graduates, by type of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.020	0.026	0.023	0.025	0.044
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Cooperative education	s.e.	0.015	0.028	0.019	0.022	0.035
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General work experience	s.e.	0.014	0.015	0.011	0.011	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B11. Standard errors for figure 31: Percentage of public high school graduates taking introductory technology courses, by area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.73	0.74	0.67	0.83	0.98
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.73	0.78	0.61	0.67	0.57
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	0.09	0.22	0.31	0.72	0.89
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B12. Standard errors for figure 32: Average number of credits earned in introductory technology courses by public high school graduates, by area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.010	0.008	0.012	0.010	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.010	0.008	0.011	0.008	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	‡	0.002	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B13. Standard errors for figure 48: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.75	0.94	0.63	0.67	0.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	1.33	1.71	1.26	1.45	0.93
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	0.82	0.82	0.67	0.54	0.55
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B14. Standard errors for table 2: Average number of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.015	0.022	0.019	0.019	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.018	0.022	0.018	0.016	0.026
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.022	0.028	0.021	0.022	0.032
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.025	0.036	0.027	0.031	0.047
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B15. Standard errors for table 3: Average number of vocational/technical credits earned by public high school graduates, by grade level of course: 1998

		Vocational/ technical total	General labor market preparation	Family and consumer sciences education	Occupational education
Total	s.e.	0.098	0.028	0.034	0.074
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
Grade level					
9	s.e.	0.028	0.019	0.010	0.020
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
10	s.e.	0.026	0.010	0.010	0.017
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
11	s.e.	0.032	0.010	0.009	0.025
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617
12	s.e.	0.047	0.011	0.013	0.038
	weighted n (in 1,000s)	2,617	2,617	2,617	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table B16. Standard errors for table 4: Average number of credits earned in family and consumer sciences education by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.006	0.009	0.007	0.009	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.006	0.007	0.005	0.008	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.007	0.009	0.005	0.008	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.008	0.011	0.010	0.010	0.013
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B17. Standard errors for table 5: Average number of credits earned in general labor market preparation by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	0.010	0.009	0.013	0.013	0.019
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	0.009	0.015	0.009	0.009	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	0.008	0.007	0.005	0.006	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	0.009	0.013	0.006	0.007	0.011
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B18. Standard errors for table 6: Average number of credits earned in core academic subjects by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.055	#	0.056	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Grade level						
9	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
10	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
11	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
12	s.e.	#	#	#	#	#
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

#Rounds to zero.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B19. Standard errors for table 7: Average credits earned in business services by public high school graduates, by computer-related area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.019	0.031	0.019	0.025	0.030
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Noncomputer-related	s.e.	0.019	0.024	0.014	0.015	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer-related	s.e.	0.002	0.016	0.012	0.019	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B20. Standard errors for table 9: Average credits earned in computer-related occupational courses and in business services courses by graduates earning 3.0 or more occupational credits, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Computer-related, total	s.e.	0.014	0.033	0.025	0.030	0.048
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Business services	s.e.	0.004	0.023	0.019	0.025	0.035
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Drafting/graphics	s.e.	‡	0.004	0.004	0.011	0.012
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Computer technology	s.e.	0.013	0.020	0.016	0.015	0.040
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Business services, total	s.e.	0.036	0.049	0.034	0.035	0.047
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Computer-related	s.e.	0.004	0.023	0.019	0.025	0.035
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Noncomputer-related	s.e.	0.036	0.040	0.026	0.029	0.024
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Total	s.e.	0.079	0.098	0.126	0.023	0.028	0.036	0.026	0.034	0.043	0.065	0.074	0.098
	weighted n (in 1,000s)	2,505	2,617		2,505	2,617		2,505	2,617		2,505	2,617	
Change in vocational/technical requirements													
Increase	s.e.	0.201	0.236	0.310	0.036	0.081	0.089	0.066	0.069	0.095	0.142	0.159	0.213
	weighted n (in 1,000s)	593	662		593	662		593	662		593	662	
No change	s.e.	0.446	0.439	0.626	0.107	0.110	0.153	0.105	0.090	0.138	0.397	0.337	0.521
	weighted n (in 1,000s)	133	235		133	235		133	235		133	235	
Decrease	s.e.	0.126	0.167	0.209	0.034	0.035	0.049	0.032	0.042	0.053	0.106	0.130	0.168
	weighted n (in 1,000s)	1,385	1,424		1,385	1,424		1,385	1,424		1,385	1,424	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	
Change in specific nonvocational/technical, nonelective requirements													
Increase	s.e.	0.166	0.191	0.253	0.036	0.046	0.058	0.061	0.059	0.085	0.126	0.165	0.208
	weighted n (in 1,000s)	821	880		821	880		821	880		821	880	
No increase	s.e.	0.113	0.187	0.218	0.034	0.045	0.056	0.029	0.048	0.056	0.098	0.132	0.164
	weighted n (in 1,000s)	1,289	1,441		1,289	1,441		1,289	1,441		1,289	1,441	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

See notes at end of table.

Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998—Continued

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in total, nonvocational/technical requirements													
Increase	s.e.	0.155	0.171	0.231	0.033	0.045	0.056	0.049	0.070	0.085	0.125	0.131	0.181
	weighted n (in 1,000s)	890	819		890	819		890	819		890	819	
No increase	s.e.	0.119	0.151	0.192	0.031	0.046	0.055	0.033	0.039	0.051	0.099	0.106	0.145
	weighted n (in 1,000s)	1,220	1,502		1,220	1,502		1,220	1,502		1,220	1,502	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	
Change in total graduation requirements													
Increase of 2 or more credits	s.e.	0.258	0.191	0.321	0.087	0.073	0.114	0.078	0.058	0.097	0.186	0.147	0.237
	weighted n (in 1,000s)	281	296		281	296		281	296		281	296	
Increase of less than 2 credits	s.e.	0.169	0.322	0.364	0.035	0.066	0.075	0.070	0.097	0.120	0.139	0.241	0.278
	weighted n (in 1,000s)	535	415		535	415		535	415		535	415	
No increase	s.e.	0.116	0.145	0.186	0.030	0.045	0.054	0.026	0.039	0.047	0.103	0.105	0.147
	weighted n (in 1,000s)	1,295	1,610		1,295	1,610		1,295	1,610		1,295	1,610	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

See notes at end of table.

Table B21. Standard errors for table 11: Average number of vocational/technical credits earned by public high school graduates by vocational/technical curriculum, by change in state high school graduation requirements: 1990 and 1998—Continued

		Vocational/technical, total			General labor market preparation			Family and consumer sciences education			Occupational education		
		1990	1998	Change	1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements													
Met in 1998 only	s.e.	0.157	0.213	0.265	0.049	0.054	0.073	0.091	0.074	0.117	0.148	0.168	0.224
	weighted n (in 1,000s)	413	526		413	526		413	526		413	526	
Met in both years	s.e.	0.268	0.365	0.453	0.064	0.095	0.115	0.096	0.123	0.156	0.161	0.415	0.445
	weighted n (in 1,000s)	138	175		138	175		138	175		138	175	
Not met in 1998	s.e.	0.112	0.154	0.190	0.029	0.044	0.053	0.030	0.047	0.056	0.094	0.103	0.139
	weighted n (in 1,000s)	1,560	1,621		1,560	1,621		1,560	1,621		1,560	1,621	
Not applicable	s.e.	0.177	0.277	0.329	0.065	0.067	0.093	0.060	0.077	0.098	0.149	0.296	0.331
	weighted n (in 1,000s)	395	296		395	296		395	296		395	296	

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		Total	1998	Change	1990	1998	Change	1990	1998	Change
Total	s.e.	1.01	0.87	1.33	1.25	1.24	1.76	1.29	1.48	1.97
	weighted n (in 1,000s)	2,505	2,617		2,505	2,617		2,505	2,617	
Change in vocational/technical requirements										
Increase	s.e.	2.10	2.23	3.06	2.66	3.06	4.05	3.12	3.82	4.93
	weighted n (in 1,000s)	593	662		593	662		593	662	
No change	s.e.	3.79	3.57	5.20	6.83	5.91	9.03	6.68	7.22	9.84
	weighted n (in 1,000s)	133	235		133	235		133	235	
Decrease	s.e.	1.58	1.61	2.25	1.95	2.28	3.01	1.96	2.33	3.05
	weighted n (in 1,000s)	1,385	1,424		1,385	1,424		1,385	1,424	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	
Change in specific nonvocational/technical, nonelective requirements										
Increase	s.e.	1.65	2.05	2.63	2.30	3.05	3.82	2.47	3.03	0.27
	weighted n (in 1,000s)	821	880		821	880		821	880	
No increase	s.e.	1.43	1.61	2.16	1.75	2.34	2.92	1.82	2.66	-0.88
	weighted n (in 1,000s)	1,289	1,441		1,289	1,441		1,289	1,441	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	-0.92
	weighted n (in 1,000s)	395	296		395	296		395	296	

See notes at end of table.

Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998—Continued

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in total, nonvocational/technical requirements										
Increase	s.e.	1.79	1.82	2.56	2.27	2.27	3.22	2.30	2.79	3.62
	weighted n (in 1,000s)	890	819		890	819		890	819	
No increase	s.e.	1.47	1.45	2.07	1.78	1.93	2.63	1.83	2.29	2.93
	weighted n (in 1,000s)	1,220	1,502		1,220	1,502		1,220	1,502	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	
Change in total graduation requirements										
Increase of 2 or more credits	s.e.	2.91	1.71	3.37	3.75	2.93	4.76	4.07	4.06	5.74
	weighted n (in 1,000s)	281	296		281	296		281	296	
Increase of less than 2 credits	s.e.	1.82	3.47	3.91	2.27	4.51	5.05	2.51	5.47	6.02
	weighted n (in 1,000s)	535	415		535	415		535	415	
No increase	s.e.	1.43	1.31	1.94	1.81	1.88	2.61	1.72	2.13	2.74
	weighted n (in 1,000s)	1,295	1,610		1,295	1,610		1,295	1,610	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	

See notes at end of table

Table B22. Standard errors for table 12: Percentage of public high school graduates by different measures of participation in vocational/technical education, by change in state high school graduation requirements: 1990 and 1998—Continued

		Occupational concentrators			Occupational investors			Vocational/technical investors		
		1990	1998	Change	1990	1998	Change	1990	1998	Change
Change in New Basics core academic requirements										
Met in 1998 only	s.e.	1.72	2.06	2.68	2.29	3.32	4.03	2.08	3.69	4.24
	weighted n (in 1,000s)	413	526		413	526		413	526	
Met in both years	s.e.	3.32	4.86	5.88	5.22	4.90	7.16	5.54	6.60	8.62
	weighted n (in 1,000s)	138	175		138	175		138	175	
Not met in 1998	s.e.	1.34	1.30	1.87	1.65	1.97	2.57	1.72	2.17	2.77
	weighted n (in 1,000s)	1,560	1,621		1,560	1,621		1,560	1,621	
Not applicable	s.e.	2.80	4.33	5.15	2.50	5.01	5.60	3.03	4.59	5.50
	weighted n (in 1,000s)	395	296		395	296		395	296	

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Studies (HSTS), 1990 and 1998.

Table B23. Standard errors for table 13: Percentage distribution of total credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Noncomputer-related	s.e.	†	0.11	0.08	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer-related, total	s.e.	†	0.11	0.08	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B24. Standard errors for table 14: Average number of credits earned in academic subjects by public high school graduates, by subject: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.074	0.116	0.094	0.092	0.127
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Core academics, total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
English	s.e.	0.019	0.034	0.019	0.028	0.037
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Mathematics	s.e.	0.019	0.028	0.019	0.021	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Science	s.e.	0.021	0.028	0.027	0.028	0.026
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Social studies	s.e.	0.024	0.040	0.023	0.041	0.038
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Foreign languages	s.e.	0.023	0.041	0.035	0.033	0.039
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Fine arts	s.e.	0.030	0.045	0.046	0.041	0.079
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B25. Standard errors for table 15: Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical participation measures						
Vocational/technical coursetakers	s.e.	0.055	0.077	0.057	0.064	0.085
	weighted n (in 1,000s)	2,559	2,454	2,125	2,150	2,526
Occupational coursetakers	s.e.	0.055	0.078	0.059	0.066	0.086
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Vocational/technical investors	s.e.	0.060	0.074	0.066	0.077	0.108
	weighted n (in 1,000s)	1,859	1,595	1,346	1,351	1,609
Occupational investors	s.e.	0.077	0.082	0.073	0.082	0.115
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Occupational concentrators	s.e.	0.096	0.081	0.093	0.083	0.132
	weighted n (in 1,000s)	878	696	542	562	654
Advanced occupational concentrators	s.e.	0.123	0.089	0.094	0.093	0.166
	weighted n (in 1,000s)	626	404	353	321	378
Advanced occupational concentrators with cooperative education	s.e.	0.312	0.135	0.135	0.125	0.353
	weighted n (in 1,000s)	109	103	85	114	118
Vocational/technical nonparticipation measures						
All graduates except vocational/ technical coursetakers	s.e.	0.224	0.164	0.265	0.168	0.184
	weighted n (in 1,000s)	48	51	50	62	90
All graduates except occupational coursetakers	s.e.	0.134	0.101	0.110	0.108	0.126
	weighted n (in 1,000s)	295	235	169	204	245
All graduates except vocational investors	s.e.	0.077	0.094	0.067	0.070	0.088
	weighted n (in 1,000s)	748	910	828	861	1,007
All graduates except occupational investors	s.e.	0.060	0.089	0.062	0.063	0.077
	weighted n (in 1,000s)	1,402	1,429	1,256	1,284	1,470
All graduates except occupational concentrators	s.e.	0.057	0.094	0.058	0.064	0.078
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
All graduates except advanced occupational concentrators	s.e.	0.054	0.083	0.057	0.063	0.079
	weighted n (in 1,000s)	1,981	2,101	1,821	1,892	2,239

See notes at end of table.

Table B25. Standard errors for table 15: Average number of credits earned in core academic subjects by public high school graduates, by selected participation measures: Various years, 1982–98 —Continued

		1982	1990	1992	1994	1998
All graduates except advanced occupational concentrators with cooperative education	s.e.	0.054	0.077	0.057	0.062	0.082
	weighted n (in 1,000s)	2,498	2,403	2,089	2,098	2,499

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B26. Standard errors for table 16: Average number of credits earned in core academic subjects by public high school graduates, by occupational concentration status and subject area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.055	0.077	0.056	0.063	0.081
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
All core academic subjects	s.e.	0.096	0.081	0.093	0.083	0.132
	weighted n (in 1,000s)	878	696	542	562	654
English	s.e.	0.032	0.030	0.030	0.026	0.055
	weighted n (in 1,000s)	878	696	542	562	654
Mathematics	s.e.	0.034	0.031	0.033	0.029	0.037
	weighted n (in 1,000s)	878	696	542	562	654
Science	s.e.	0.029	0.041	0.040	0.033	0.051
	weighted n (in 1,000s)	878	696	542	562	654
Social studies	s.e.	0.035	0.042	0.028	0.050	0.047
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
All core academic subjects	s.e.	0.057	0.094	0.058	0.064	0.078
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
English	s.e.	0.021	0.042	0.020	0.032	0.035
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Mathematics	s.e.	0.020	0.032	0.019	0.022	0.024
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Science	s.e.	0.024	0.032	0.030	0.030	0.027
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Social studies	s.e.	0.025	0.044	0.026	0.041	0.039
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B27. Standard errors for table 17: Percentage of public high school graduates meeting New Basics standards in core academic subjects, by occupational concentration status and academic subject area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.59	1.70	1.18	1.50	2.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
All core academic subjects	s.e.	0.65	1.73	1.52	1.89	3.45
	weighted n (in 1,000s)	878	696	542	562	654
4 years of English	s.e.	1.57	2.18	1.35	1.42	2.75
	weighted n (in 1,000s)	878	696	542	562	654
3 years of mathematics	s.e.	1.19	2.11	1.66	2.04	1.77
	weighted n (in 1,000s)	878	696	542	562	654
3 years of science	s.e.	0.89	2.01	1.69	1.93	2.32
	weighted n (in 1,000s)	878	696	542	562	654
3 years of social studies	s.e.	1.59	2.34	1.39	2.70	1.98
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
All core academic subjects	s.e.	0.78	2.03	1.36	1.64	2.30
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
4 years of English	s.e.	1.17	2.10	0.82	1.47	1.73
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of mathematics	s.e.	0.98	1.56	1.00	0.94	0.94
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of science	s.e.	0.93	1.45	1.32	1.15	1.37
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
3 years of social studies	s.e.	1.18	1.22	0.84	1.32	0.79
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B28. Standard errors for table A1: Percentage of public high school graduates taking vocational/technical education courses, by vocational/technical curriculum: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.19	0.24	0.27	0.32	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education	s.e.	0.47	0.68	0.48	0.66	0.80
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Family and consumer sciences education	s.e.	0.91	1.64	1.19	1.74	2.29
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation	s.e.	0.71	1.58	1.28	1.62	2.08
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B29. Standard errors for table A2: Percentage of public high school graduates meeting different definitions of participation in vocational/technical education: Various years, 1982–98

		1982	1990	1992	1994	1998
Vocational/technical coursetakers	s.e.	0.19	0.24	0.27	0.32	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational coursetakers	s.e.	0.47	0.68	0.48	0.66	0.80
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical investors	s.e.	0.79	1.29	1.12	1.19	1.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational investors	s.e.	0.85	1.25	1.02	1.06	1.24
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	0.83	1.01	0.78	0.95	0.87
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced occupational concentrators	s.e.	0.71	0.64	0.63	0.72	0.81
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced occupational concentrators with cooperative education	s.e.	0.33	0.49	0.33	0.45	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B30. Standard errors for table A3: Average number of credits earned in general labor market preparation by public high school graduates, by area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Basic typewriting/keyboarding	s.e.	0.009	0.016	0.011	0.016	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts/technology education, total	s.e.	0.010	0.008	0.012	0.010	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Industrial arts	s.e.	0.010	0.008	0.011	0.008	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	‡	0.002	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Career preparation/general work experience	s.e.	0.014	0.015	0.011	0.011	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B31. Standard errors for table A4: Percentage distribution of vocational/technical credits earned by public high school graduates, by grade level of course: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
Grade level						
9	s.e.	0.38	0.67	0.56	0.56	0.72
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
10	s.e.	0.34	0.58	0.57	0.49	0.54
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
11	s.e.	0.35	0.41	0.42	0.40	0.50
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526
12	s.e.	0.41	0.57	0.52	0.48	0.61
	weighted n (in 1,000s)	2,554	2,454	2,123	2,150	2,526

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B32. Standard errors for table A5: Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.47	0.68	0.48	0.66	0.80	0.93
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.68	0.88	0.65	0.61	0.80	1.05
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.82	1.10	0.75	1.31	1.33	1.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.57	0.77	0.51	0.63	0.81	0.99
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.40	0.49	0.51	0.51	0.56	0.69
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.41	0.58	0.38	0.43	0.55	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.33	0.53	0.28	0.31	0.62	0.70
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	0.29	0.31	0.25	0.50	0.34	0.45
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Child care and education	s.e.	0.52	0.68	0.48	0.73	0.80	0.96
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.59	0.93	0.65	0.94	1.33	1.45
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	0.09	0.21	0.22	0.29	0.24	0.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.25	0.34	0.30	0.54	0.55	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.48	0.58	0.52	0.79	0.91	1.03
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.71	0.89	0.77	0.68	1.06	1.27
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.23	0.19	0.27	0.22	0.52	0.57
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.

Table B32. Standard errors for table A5: Percentage of public high school graduates earning credits in occupational education, by program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Health care	s.e.	0.47	0.61	0.44	0.46	0.82	0.95
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.77	1.71	1.08	1.32	2.00	2.14
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.64	0.70	0.62	0.93	1.08	1.26
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Computer technology	s.e.	0.59	1.40	1.20	1.73	2.56	2.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B33. Standard errors for table A6: Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Total	s.e.	0.053	0.065	0.050	0.057	0.074	0.091
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.019	0.031	0.019	0.025	0.030	0.036
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.016	0.017	0.013	0.011	0.014	0.021
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.018	0.016	0.016	0.011	0.013	0.022
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.010	0.010	0.009	0.012	0.014	0.017
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.010	0.008	0.017	0.009	0.010	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.011	0.010	0.014	0.009	0.009	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.006	0.013	0.004	0.003	0.008	0.010
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.016	0.022	0.015	0.023	0.031	0.035
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.011	0.012	0.009	0.015	0.014	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	‡	0.002	‡	0.003	0.004	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	‡	0.003	‡	0.004	0.003	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.012	0.014	0.014	0.012	0.021	0.041
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.000	0.002	0.004	0.002	0.006	0.006
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.004	0.005	0.005	0.006	0.008	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.

Table B33. Standard errors for table A6: Average number of occupational credits earned by public high school graduates, by program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998	Change in average number from 1982 to 1998
Child care and education	s.e.	0.005	0.006	0.005	0.009	0.010	0.011
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.005	0.006	0.007	0.007	0.013	0.014
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Health care	s.e.	0.005	0.005	0.007	0.007	0.030	0.030
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Computer technology	s.e.	0.007	0.013	0.011	0.013	0.027	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

†Not applicable.

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B34. Standard errors for table A7: Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.83	1.01	0.78	0.95	0.87	1.20
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business services	s.e.	0.41	0.52	0.32	0.35	0.35	0.53
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Materials production	s.e.	0.26	0.24	0.16	0.14	0.22	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mechanics and repair	s.e.	0.26	0.25	0.20	0.16	0.18	0.32
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Personal and other services	s.e.	0.20	0.17	0.25	0.15	0.11	0.23
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Construction	s.e.	0.16	0.14	0.18	0.13	0.16	0.23
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Agriculture	s.e.	0.29	0.35	0.26	0.37	0.54	0.61
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other precision production	s.e.	0.08	0.15	0.05	0.04	0.07	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Print production	s.e.	0.21	0.19	0.26	0.17	0.27	0.34
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Marketing	s.e.	0.19	0.29	0.18	0.23	0.22	0.29
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Transportation	s.e.	0.02	0.05	0.01	0.04	0.04	0.04
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Protective services	s.e.	0.02	‡	0.04	0.02	0.03	0.04
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Other technology	s.e.	0.03	0.02	0.06	0.02	0.06	0.07
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Food service and hospitality	s.e.	0.06	0.12	0.10	0.07	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business management	s.e.	0.06	0.06	0.07	0.10	0.13	0.14
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

See notes at end of table.

Table B34. Standard errors for table A7: Percentage of public high school graduates concentrating in occupational education, by program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Computer technology	s.e.	0.07	0.06	0.08	0.06	0.18	0.19
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Child care and education	s.e.	0.05	0.05	0.07	0.11	0.10	0.11
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Communications technology	s.e.	0.04	0.05	0.05	0.06	0.12	0.13
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Health care	s.e.	0.10	0.09	0.10	0.11	0.46	0.48
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Mixed programs							
Precision production	s.e.	0.26	0.23	0.15	0.14	0.19	0.33
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Business	s.e.	0.21	0.21	0.24	0.21	0.14	0.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Trade and industry	s.e.	0.20	0.22	0.18	0.15	0.17	0.26
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	
Technology	s.e.	‡	0.05	0.10	0.04	0.11	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617	

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B35. Standard errors for table A8: Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	0.88	0.98	0.83	1.00	0.88	1.25
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372	
Business services	s.e.	0.92	1.04	0.68	0.62	0.69	1.15
	weighted n (in 1,000s)	1,097	1,174	1,028	1,137	1,162	
Mechanics and repair	s.e.	1.80	2.17	1.93	1.86	1.71	2.48
	weighted n (in 1,000s)	340	253	204	197	261	
Materials production	s.e.	1.24	1.53	1.27	1.19	1.74	2.14
	weighted n (in 1,000s)	530	372	269	215	303	
Agriculture	s.e.	2.25	2.31	2.24	2.03	3.35	4.04
	weighted n (in 1,000s)	264	228	212	249	278	
Personal and other services	s.e.	2.87	3.10	3.11	2.39	2.39	3.74
	weighted n (in 1,000s)	163	135	144	127	120	
Other precision production	s.e.	1.87	3.24	1.58	1.63	1.99	2.74
	weighted n (in 1,000s)	102	102	67	49	79	
Marketing	s.e.	1.89	3.15	1.99	2.40	1.86	2.65
	weighted n (in 1,000s)	240	234	181	228	273	
Other technology	s.e.	2.67	2.42	2.35	1.78	2.29	3.52
	weighted n (in 1,000s)	31	23	53	26	70	
Print production	s.e.	0.99	0.99	1.31	0.88	1.06	1.45
	weighted n (in 1,000s)	501	468	412	387	537	
Transportation	s.e.	3.88	4.77	1.16	2.82	3.61	5.31
	weighted n (in 1,000s)	12	27	23	28	26	
Computer technology	s.e.	0.51	0.16	0.17	0.22	0.45	0.68
	weighted n (in 1,000s)	344	968	970	635	896	
Construction	s.e.	2.04	3.02	2.82	1.87	2.41	3.15
	weighted n (in 1,000s)	190	139	115	145	147	
Business management	s.e.	0.26	0.34	0.34	0.52	0.71	0.76
	weighted n (in 1,000s)	619	466	411	416	422	
Protective services	s.e.	1.51	‡	2.50	2.51	2.59	3.00
	weighted n (in 1,000s)	35	14	31	29	35	

See notes at end of table.

Table B35. Standard errors for table A8: Percentage of occupational coursetakers concentrating in occupational education, by program area in which they took courses: Various years, 1982–98 —Continued

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Food service and hospitality	s.e.	2.58	4.79	4.06	2.54	2.69	3.73
	weighted n (in 1,000s)	59	58	49	69	84	
Communications technology	s.e.	0.34	0.51	0.49	0.64	0.74	0.82
	weighted n (in 1,000s)	281	242	212	235	396	
Child care and education	s.e.	0.67	0.97	1.19	1.92	1.30	1.46
	weighted n (in 1,000s)	199	144	125	135	203	
Health care	s.e.	2.43	5.70	2.58	2.43	5.10	5.65
	weighted n (in 1,000s)	118	69	87	102	174	

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's sum to greater than totals, because some graduates took courses in more than one occupational program area.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992, and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B36. Standard errors for table A9: Percentage distribution of occupational concentrators, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Transportation	s.e.	0.06	0.17	0.05	0.17	0.15
	weighted n (in 1,000s)	878	696	542	562	654
Protective services	s.e.	0.06	‡	0.14	0.09	0.12
	weighted n (in 1,000s)	878	696	542	562	654
Other technology	s.e.	0.09	0.08	0.24	0.08	0.24
	weighted n (in 1,000s)	878	696	542	562	654
Other precision production	s.e.	0.23	0.52	0.19	0.15	0.29
	weighted n (in 1,000s)	878	696	542	562	654
Business management	s.e.	0.19	0.23	0.26	0.37	0.51
	weighted n (in 1,000s)	878	696	542	562	654
Food service and hospitality	s.e.	0.17	0.40	0.39	0.27	0.41
	weighted n (in 1,000s)	878	696	542	562	654
Child care and education	s.e.	0.15	0.19	0.27	0.41	0.39
	weighted n (in 1,000s)	878	696	542	562	654
Computer technology	s.e.	0.20	0.23	0.30	0.24	0.71
	weighted n (in 1,000s)	878	696	542	562	654
Personal and other services	s.e.	0.59	0.59	0.96	0.54	0.42
	weighted n (in 1,000s)	878	696	542	562	654
Communications technology	s.e.	0.11	0.17	0.19	0.23	0.47
	weighted n (in 1,000s)	878	696	542	562	654
Construction	s.e.	0.47	0.46	0.68	0.48	0.62
	weighted n (in 1,000s)	878	696	542	562	654
Materials production	s.e.	0.71	0.85	0.62	0.54	0.86
	weighted n (in 1,000s)	878	696	542	562	654
Marketing	s.e.	0.56	1.03	0.69	0.88	0.91
	weighted n (in 1,000s)	878	696	542	562	654
Mechanics and repair	s.e.	0.73	0.85	0.76	0.61	0.75
	weighted n (in 1,000s)	878	696	542	562	654

See notes at end of table.

Table B36. Standard errors for table A9: Percentage distribution of occupational concentrators, by program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
Health care	s.e.	0.31	0.32	0.38	0.41	1.74
	weighted n (in 1,000s)	878	696	542	562	654
Print production	s.e.	0.60	0.62	1.01	0.66	1.01
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	0.84	1.22	1.02	1.33	2.14
	weighted n (in 1,000s)	878	696	542	562	654
Business services	s.e.	1.08	1.64	1.16	1.16	1.31
	weighted n (in 1,000s)	878	696	542	562	654
Mixed programs						
Technology	s.e.	‡	0.18	0.38	0.15	0.41
	weighted n (in 1,000s)	878	696	542	562	654
Business	s.e.	0.60	0.72	0.93	0.72	0.59
	weighted n (in 1,000s)	878	696	542	562	654
Precision production	s.e.	0.77	0.80	0.58	0.54	0.78
	weighted n (in 1,000s)	878	696	542	562	654
Trade and industry	s.e.	0.58	0.79	0.71	0.69	0.68
	weighted n (in 1,000s)	878	696	542	562	654

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B37. Standard errors for table A10: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by various concentration definitions: Various years, 1982–98

		1982	1990	1992	1994	1998
Occupational concentrators	s.e.	1.03	1.35	1.21	1.48	1.10
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Advanced occupational concentrators	s.e.	1.13	1.19	1.17	1.49	1.70
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Advanced occupational concentrators with cooperative education	s.e.	0.69	1.09	0.76	0.97	1.38
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B38. Standard errors for table A11: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	1.03	1.35	1.21	1.48	1.10	1.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business services	s.e.	0.81	1.11	0.71	0.71	0.75	1.10
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Materials production	s.e.	0.54	0.57	0.38	0.34	0.49	0.73
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mechanics and repair	s.e.	0.55	0.55	0.46	0.40	0.43	0.69
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Personal and other services	s.e.	0.43	0.39	0.58	0.36	0.25	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other precision production	s.e.	0.17	0.34	0.12	0.09	0.17	0.24
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Construction	s.e.	0.35	0.32	0.41	0.31	0.36	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Agriculture	s.e.	0.61	0.79	0.61	0.81	1.20	1.35
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Transportation	s.e.	0.04	0.11	0.03	0.10	0.08	0.09
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Protective services	s.e.	0.04	‡	0.08	0.06	0.07	0.08
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other technology	s.e.	0.07	0.05	0.14	0.05	0.14	0.15
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Print production	s.e.	0.44	0.42	0.61	0.42	0.60	0.74
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Marketing	s.e.	0.41	0.68	0.42	0.55	0.53	0.67
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Food service and hospitality	s.e.	0.13	0.27	0.23	0.17	0.23	0.26
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business management	s.e.	0.14	0.15	0.15	0.23	0.30	0.32
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

See notes at end of table.

Table B38. Standard errors for table A11: Percentage of public high school graduates earning 3.0 or more occupational credits who concentrated in occupational education, by program area of concentration: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Computer technology	s.e.	0.14	0.15	0.18	0.14	0.41	0.43
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Child care and education	s.e.	0.11	0.13	0.16	0.25	0.23	0.25
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Communications technology	s.e.	0.08	0.11	0.11	0.14	0.26	0.27
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Health care	s.e.	0.22	0.21	0.23	0.26	1.03	1.05
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mixed programs							
Precision production	s.e.	0.56	0.51	0.34	0.33	0.45	0.72
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business	s.e.	0.44	0.47	0.56	0.47	0.33	0.55
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Trade and industry	s.e.	0.42	0.48	0.42	0.38	0.37	0.56
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Technology	s.e.	‡	0.12	0.23	0.09	0.23	†
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

†Not applicable.

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B39. Standard errors for table A12: Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	†	†	†	†	†	†
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business services	s.e.	0.70	1.00	0.66	0.69	0.97	1.20
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Materials production	s.e.	0.48	0.56	0.41	0.41	0.49	0.68
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Mechanics and repair	s.e.	0.50	0.47	0.41	0.42	0.49	0.70
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Business management	s.e.	0.33	0.36	0.34	0.44	0.48	0.58
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Personal and other services	s.e.	0.39	0.36	0.47	0.34	0.31	0.50
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Construction	s.e.	0.29	0.31	0.36	0.32	0.38	0.47
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other precision production	s.e.	0.19	0.35	0.15	0.14	0.29	0.35
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Marketing	s.e.	0.42	0.51	0.45	0.61	0.59	0.73
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Protective services	s.e.	0.08	0.04	0.08	0.09	0.12	0.15
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Transportation	s.e.	0.06	0.09	0.10	0.16	0.11	0.12
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Agriculture	s.e.	0.56	0.86	0.64	0.82	1.15	1.28
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Print production	s.e.	0.49	0.52	0.58	0.49	0.77	0.91
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Other technology	s.e.	0.08	0.08	0.14	0.08	0.23	0.25
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Food service and hospitality	s.e.	0.14	0.23	0.22	0.26	0.33	0.36
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

See notes at end of table.

Table B39. Standard errors for table A12: Percentage distribution of occupational credits earned by public high school graduates who earned 3.0 or more occupational credits, by program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Child care and education	s.e.	0.20	0.22	0.19	0.32	0.36	0.41
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Communications technology	s.e.	0.17	0.22	0.29	0.24	0.44	0.47
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Health care	s.e.	0.19	0.20	0.26	0.30	0.88	0.90
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	
Computer technology	s.e.	0.21	0.44	0.36	0.34	0.80	0.82
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147	

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B40. Standard errors for table A13: Average number of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98

		1982	1990	1992	1994	1998	Change from 1982 to 1998
Total	s.e.	0.074	0.069	0.092	0.050	0.101	0.125
	weighted n (in 1,000s)	878	696	542	562	654	
Course level							
First	s.e.	0.065	0.082	0.056	0.064	0.102	0.121
	weighted n (in 1,000s)	878	696	542	562	654	
Second or higher	s.e.	0.044	0.068	0.051	0.047	0.054	0.070
	weighted n (in 1,000s)	878	696	542	562	654	
Specialty	s.e.	0.023	0.025	0.051	0.025	0.026	0.035
	weighted n (in 1,000s)	878	696	542	562	654	
Cooperative education	s.e.	0.025	0.051	0.047	0.049	0.091	0.094
	weighted n (in 1,000s)	878	696	542	562	654	

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B41. Standard errors for table A14: Percentage distribution of credits earned by occupational concentrators in their area of concentration, by level of course: Various years, 1982–98

		1982	1990	1992	1994	1998	Change in percentage from 1982 to 1998
Total	s.e.	†	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654	
Course level							
First	s.e.	0.83	1.47	0.99	1.08	1.45	1.67
	weighted n (in 1,000s)	878	696	542	562	654	
Second or higher	s.e.	0.72	1.21	0.80	0.93	1.23	1.43
	weighted n (in 1,000s)	878	696	542	562	654	
Specialty	s.e.	0.50	0.61	0.65	0.58	0.66	0.83
	weighted n (in 1,000s)	878	696	542	562	654	
Cooperative education	s.e.	0.57	1.15	0.83	1.10	1.69	1.79
	weighted n (in 1,000s)	878	696	542	562	654	

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B42. Standard errors for table A15: Percentage of total occupational credits earned by occupational coursetakers that were cooperative education credits: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.34	0.61	0.46	0.51	0.71
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B43. Standard errors for table A16: Average number of computer-related credits earned by public high school graduates, by vocational/technical curriculum and subarea: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.007	0.027	0.019	0.025	0.029
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
General labor market preparation, total	s.e.	†	0.016	0.011	0.019	0.019
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Basic typewriting/keyboarding	s.e.	†	0.016	0.011	0.016	0.018
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Technology education	s.e.	†	‡	‡	0.007	0.009
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational education, total	s.e.	0.007	0.022	0.016	0.023	0.033
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Business services	s.e.	0.002	0.016	0.012	0.019	0.024
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Drafting	s.e.	‡	0.002	0.002	0.006	0.007
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer technology, total	s.e.	0.007	0.013	0.011	0.013	0.027
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer applications	s.e.	0.001	0.007	0.004	0.009	0.021
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer programming	s.e.	0.003	0.011	0.005	0.005	0.005
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Data processing	s.e.	0.005	‡	0.004	‡	‡
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer science and systems	s.e.	0.002	0.011	0.009	0.009	0.012
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Computer mathematics	s.e.	0.002	0.005	0.004	0.003	0.005
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B44. Standard errors for table A17: Percentage distribution of computer-related credits earned by public high school graduates, by vocational/technical curriculum and computer-related area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
General labor market preparation, total	s.e.	†	1.77	1.13	1.58	2.08
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Basic typewriting/keyboarding	s.e.	†	1.77	1.13	1.59	2.03
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Technology education	s.e.	†	‡	‡	0.41	0.71
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Occupational education, total	s.e.	†	1.77	1.13	1.58	2.08
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Business services	s.e.	†	1.50	1.14	1.57	2.45
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Drafting	s.e.	†	0.22	0.19	0.35	0.50
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer technology, total	s.e.	†	1.15	0.94	1.28	2.25
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer applications	s.e.	†	0.63	0.33	0.97	1.45
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer programming	s.e.	†	0.77	0.44	0.44	0.35
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Data processing	s.e.	†	0.36	0.32	0.10	0.26
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer science and systems	s.e.	†	1.32	0.89	1.04	1.44
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095
Computer mathematics	s.e.	†	0.47	0.45	0.22	0.43
	weighted n (in 1,000s)	364	1,990	1,708	1,784	2,095

†Not applicable.

‡Reporting standards not met. (Too few cases.)

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B45. Standard errors for table A18: Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98

		1982	1990	1992	1994	1998
General labor market preparation, total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Noncomputer-related	s.e.	†	1.52	1.47	1.86	2.45
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Computer-related, total	s.e.	†	1.52	1.47	1.86	2.45
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Basic typewriting/keyboarding	s.e.	†	1.52	1.47	1.89	2.57
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Technology education	s.e.	†	‡	‡	0.62	1.24
	weighted n (in 1,000s)	2,023	1,722	1,304	1,353	1,539
Occupational education, total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Noncomputer-related	s.e.	0.33	1.00	0.84	0.93	1.30
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer-related, total	s.e.	0.33	1.00	0.84	0.93	1.30
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Business services	s.e.	0.07	0.83	0.70	1.00	1.17
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Drafting	s.e.	‡	0.12	0.12	0.19	0.28
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer technology, total	s.e.	0.33	0.76	0.69	0.81	1.25
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer applications	s.e.	0.07	0.40	0.21	0.58	0.79
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer programming	s.e.	0.22	0.53	0.29	0.27	0.26
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Data processing	s.e.	0.18	0.24	0.18	0.06	0.11
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

See notes at end of table.

Table B45. Standard errors for table A18: Percentage distribution of general labor market preparation and of occupational education credits earned by public high school graduates, by computer-related and noncomputer-related areas: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
Computer science and systems	s.e.	0.13	0.72	0.55	0.63	0.74
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Computer mathematics	s.e.	0.17	0.36	0.38	0.15	0.35
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372

†Not applicable.

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B46. Standard errors for table A19: Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced mathematics	s.e.	0.70	1.13	0.94	1.06	1.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Upper-middle mathematics	s.e.	0.62	0.86	0.98	0.83	1.17
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Lower-middle mathematics	s.e.	0.75	0.79	0.80	0.78	0.97
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Low mathematics	s.e.	0.78	0.98	0.66	0.68	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Advanced mathematics	s.e.	0.77	1.25	1.10	1.14	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Upper-middle mathematics	s.e.	0.85	1.25	1.21	1.09	1.44
	weighted n (in 1,000s)	878	696	542	562	654
Lower-middle mathematics	s.e.	1.31	1.26	1.31	0.97	1.52
	weighted n (in 1,000s)	878	696	542	562	654
Low mathematics	s.e.	1.35	1.70	1.28	1.36	0.87
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Advanced mathematics	s.e.	0.90	1.13	1.14	1.23	1.40
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Upper-middle mathematics	s.e.	0.77	0.94	1.22	0.91	1.28
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Lower-middle mathematics	s.e.	0.86	0.82	0.93	0.87	0.93
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

See notes at end of table.

Table B46. **Standard errors for table A19: Percentage distribution of public high school graduates according to level of mathematics coursetaking achieved, by occupational concentration status: Various years, 1982–98—Continued**

		1982	1990	1992	1994	1998
Low mathematics	s.e.	0.85	0.91	0.70	0.61	0.67
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B47. Standard errors for table A20: Percentage distribution of public high school graduates according to level of science coursetaking achieved, by occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Advanced science	s.e.	0.78	1.18	1.07	1.30	1.46
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Biology	s.e.	1.05	1.46	1.06	1.35	1.16
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Low science	s.e.	1.03	1.23	0.71	0.94	0.93
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	878	696	542	562	654
Advanced science	s.e.	0.93	1.29	1.42	1.64	2.10
	weighted n (in 1,000s)	878	696	542	562	654
Biology	s.e.	1.62	2.07	1.63	1.91	1.87
	weighted n (in 1,000s)	878	696	542	562	654
Low science	s.e.	1.66	2.39	1.22	1.46	1.50
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Advanced science	s.e.	0.95	1.33	1.27	1.31	1.50
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Biology	s.e.	1.14	1.42	1.18	1.27	1.09
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Low science	s.e.	1.03	0.94	0.79	0.95	0.94
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B48. Standard errors for table A21: Percentage distribution of public high school graduates according to level of English coursetaking achieved, by occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Advanced English	s.e.	0.76	1.43	0.92	1.28	1.56
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Middle English	s.e.	1.00	1.68	1.13	1.53	1.88
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Low English	s.e.	0.75	1.53	0.92	1.41	1.57
	weighted n (in 1,000s)	2,602	2,489	2,164	2,195	2,585
Occupational concentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	875	688	535	554	13
Advanced English	s.e.	0.76	1.12	1.08	1.23	1.97
	weighted n (in 1,000s)	875	688	535	554	644
Middle English	s.e.	1.34	2.18	1.60	2.01	2.04
	weighted n (in 1,000s)	875	688	535	554	644
Low English	s.e.	1.11	1.85	1.46	1.61	2.33
	weighted n (in 1,000s)	875	688	535	554	644
Nonconcentrators	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Advanced English	s.e.	0.92	1.62	1.10	1.46	1.62
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Middle English	s.e.	1.11	1.81	1.30	1.57	2.05
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941
Low English	s.e.	0.80	1.66	1.02	1.53	1.46
	weighted n (in 1,000s)	1,728	1,801	1,629	1,640	1,941

†Not applicable.

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B49. Standard errors for table A22: Percentage of public high school graduates completing specific science courses, by occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Biology, chemistry, or physics, total	s.e.	0.74	0.90	0.36	0.33	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Biology	s.e.	0.80	0.96	0.41	0.59	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Chemistry	s.e.	0.74	1.32	1.05	0.98	1.25
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Physics	s.e.	0.69	0.96	0.89	1.12	1.43
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators						
Biology, chemistry, or physics, total	s.e.	1.38	1.72	0.85	0.65	1.37
	weighted n (in 1,000s)	878	696	542	562	654
Biology	s.e.	1.42	1.86	0.88	0.84	1.39
	weighted n (in 1,000s)	878	696	542	562	654
Chemistry	s.e.	0.97	1.40	1.37	1.49	2.01
	weighted n (in 1,000s)	878	696	542	562	654
Physics	s.e.	0.94	0.99	1.15	1.09	1.92
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
Biology, chemistry, or physics, total	s.e.	0.67	0.70	0.32	0.28	0.48
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Biology	s.e.	0.76	0.73	0.40	0.56	0.57
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Chemistry	s.e.	0.93	1.44	1.22	1.03	1.30
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Physics	s.e.	0.81	1.02	1.02	1.19	1.63
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B50. Standard errors for table A23: Percentage of public high school graduates completing U.S. or world history courses, by type of course and occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.78	1.16	0.62	0.58	1.46
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
U.S. history	s.e.	0.92	1.49	0.77	0.81	1.49
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
World history	s.e.	1.37	2.73	1.46	2.62	3.32
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentrators	s.e.	1.19	1.40	1.16	0.40	1.59
	weighted n (in 1,000s)	878	696	542	562	654
U.S. history	s.e.	1.29	1.64	1.32	0.70	1.68
	weighted n (in 1,000s)	878	696	542	562	654
World history	s.e.	1.70	3.28	2.00	3.11	3.31
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators	s.e.	0.76	1.28	0.60	0.71	1.45
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
U.S. history	s.e.	0.97	1.60	0.79	0.92	1.48
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
World history	s.e.	1.52	2.78	1.59	2.67	3.49
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B51. Standard errors for table A24: Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.49	1.18	1.06	1.11	1.69
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Vocational/technical participation measures						
Vocational/technical coursetakers	s.e.	0.48	1.16	1.07	1.08	1.69
	weighted n (in 1,000s)	2,559	2,454	2,125	2,150	2,526
Occupational coursetakers	s.e.	0.44	1.14	1.09	1.08	1.76
	weighted n (in 1,000s)	2,312	2,270	2,005	2,009	2,372
Vocational/technical investors	s.e.	0.29	0.99	0.90	0.92	1.87
	weighted n (in 1,000s)	1,859	1,595	1,346	1,351	1,609
Occupational investors	s.e.	0.29	0.98	0.99	0.95	1.93
	weighted n (in 1,000s)	1,205	1,076	918	928	1,147
Occupational concentrators	s.e.	0.31	0.89	1.01	0.96	2.07
	weighted n (in 1,000s)	878	696	542	562	654
Advanced occupational concentrators	s.e.	0.31	1.01	1.31	1.19	2.42
	weighted n (in 1,000s)	626	404	353	321	378
Advanced occupational concentrators with cooperative education	s.e.	0.53	1.53	3.62	1.49	4.53
	weighted n (in 1,000s)	109	103	85	114	118
Vocational/technical nonparticipation measures						
All graduates except vocational/ technical coursetakers	s.e.	4.56	4.08	5.83	3.24	5.68
	weighted n (in 1,000s)	48	51	50	62	90
All graduates except occupational coursetakers	s.e.	1.84	2.70	3.05	2.73	3.04
	weighted n (in 1,000s)	295	235	169	204	245
All graduates except vocational/ technical investors	s.e.	1.27	2.25	1.87	1.86	2.52
	weighted n (in 1,000s)	748	910	828	861	1,007
All graduates except occupational investors	s.e.	0.79	1.69	1.45	1.57	2.02
	weighted n (in 1,000s)	1,402	1,429	1,256	1,284	1,470
All graduates except occupational concentrators	s.e.	0.68	1.54	1.28	1.42	1.88
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
All graduates except advanced occupational concentrators	s.e.	0.61	1.36	1.19	1.30	1.76
	weighted n (in 1,000s)	1,981	2,101	1,821	1,892	2,239

See notes at end of table.

Table B51. Standard errors for table A24: Percentage of public high school graduates completing a college-preparatory course of study, by selected vocational/technical participation and nonparticipation measures: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
All graduates except advanced occupational concentrators with cooperative	s.e.	0.51	1.24	1.09	1.18	1.74
education	weighted n (in 1,000s)	2,498	2,403	2,089	2,098	2,499

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B52. Standard errors for table A25: Percentage distribution of public high school graduates according to college-preparatory and occupational concentration status: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	†	†	†	†	†
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory only	s.e.	0.47	1.09	1.03	0.99	1.43
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Occupational concentration only	s.e.	0.83	0.89	0.74	0.83	0.68
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Both college-preparatory and occupational concentration	s.e.	0.11	0.28	0.27	0.29	0.63
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Neither college-preparatory nor occupational concentration	s.e.	0.83	1.40	1.05	1.35	1.53
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617

†Not applicable.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B53. Standard errors for table A26: Percentage of occupational concentrators and nonconcentrators completing college-preparatory coursework, by subject: Various years, 1982–98

		1982	1990	1992	1994	1998
Occupational concentrators						
College-preparatory, total	s.e.	0.31	0.89	1.01	0.96	2.07
	weighted n (in 1,000s)	878	696	542	562	654
English	s.e.	1.57	2.18	1.35	1.42	2.75
	weighted n (in 1,000s)	878	696	542	562	654
Mathematics	s.e.	0.82	1.26	1.41	1.41	1.87
	weighted n (in 1,000s)	878	696	542	562	654
Science	s.e.	0.97	1.81	1.55	1.57	2.15
	weighted n (in 1,000s)	878	696	542	562	654
Social studies	s.e.	1.45	1.70	1.23	0.54	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Foreign languages	s.e.	0.75	1.63	1.37	1.51	2.18
	weighted n (in 1,000s)	878	696	542	562	654
Nonconcentrators						
College-preparatory, total	s.e.	0.68	1.54	1.28	1.42	1.88
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
English	s.e.	1.17	2.10	0.82	1.47	1.73
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Mathematics	s.e.	0.97	1.45	1.26	1.21	1.21
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Science	s.e.	0.95	1.35	1.22	1.04	1.24
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Social studies	s.e.	1.01	1.45	0.75	0.78	1.65
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Foreign languages	s.e.	1.02	1.52	1.29	1.21	1.32
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B54. Standard errors for table A27: Average number of credits earned in vocational/technical education by public high school graduates, by vocational/technical curriculum and whether graduates completed college-preparatory coursework: Various years, 1982–98

		1982	1990	1992	1994	1998
Vocational/technical, total	s.e.	0.059	0.079	0.063	0.068	0.098
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.071	0.077	0.062	0.066	0.114
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.060	0.097	0.077	0.088	0.132
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
Occupational education	s.e.	0.053	0.065	0.050	0.057	0.074
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.055	0.062	0.053	0.054	0.094
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.054	0.081	0.065	0.079	0.096
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
General labor market preparation	s.e.	0.018	0.023	0.019	0.021	0.028
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.028	0.024	0.018	0.021	0.026
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.019	0.028	0.024	0.024	0.037
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600
Family and consumer sciences education	s.e.	0.017	0.026	0.018	0.028	0.034
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
College-preparatory	s.e.	0.025	0.017	0.020	0.021	0.034
	weighted n (in 1,000s)	227	719	697	812	1,017
Not college-preparatory	s.e.	0.019	0.032	0.023	0.035	0.042
	weighted n (in 1,000s)	2,380	1,786	1,478	1,400	1,600

NOTE: Weighted n's may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B55. Standard errors for table A28: Percentage of public high school graduates meeting selected definitions of participation in vocational/technical education, by college-preparatory coursework status: 1998

		College-preparatory	Not college-preparatory
Total		†	†
Vocational/technical coursetakers	s.e.	0.77	0.50
	weighted n (in 1,000s)	1,017	1,600
Occupational coursetakers	s.e.	1.39	0.69
	weighted n (in 1,000s)	1,017	1,600
Vocational/technical investors	s.e.	2.29	1.78
	weighted n (in 1,000s)	1,017	1,600
Occupational investors	s.e.	1.89	1.43
	weighted n (in 1,000s)	1,017	1,600
Occupational concentrators	s.e.	1.35	1.07
	weighted n (in 1,000s)	1,017	1,600
Advanced occupational concentrators	s.e.	1.08	0.92
	weighted n (in 1,000s)	1,017	1,600
Advanced occupational concentrators with cooperative education	s.e.	0.98	0.54
	weighted n (in 1,000s)	1,017	1,600

†Not applicable

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table B56. Standard errors for table A29: Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998

		College-preparatory	Not college-preparatory
Total	s.e.	1.35	1.07
	weighted n (in 1,000s)	1,017	1,600
Health care	s.e.	0.94	0.23
	weighted n (in 1,000s)	1,017	1,600
Communications technology	s.e.	0.20	0.11
	weighted n (in 1,000s)	1,017	1,600
Business services	s.e.	0.55	0.38
	weighted n (in 1,000s)	1,017	1,600
Computer technology	s.e.	0.24	0.18
	weighted n (in 1,000s)	1,017	1,600
Transportation	s.e.	0.02	0.05
	weighted n (in 1,000s)	1,017	1,600
Other precision production	s.e.	0.10	0.08
	weighted n (in 1,000s)	1,017	1,600
Business management	s.e.	0.17	0.12
	weighted n (in 1,000s)	1,017	1,600
Other technology	s.e.	0.07	0.07
	weighted n (in 1,000s)	1,017	1,600
Child care and education	s.e.	0.11	0.13
	weighted n (in 1,000s)	1,017	1,600
Food service and hospitality	s.e.	0.05	0.14
	weighted n (in 1,000s)	1,017	1,600
Personal and other services	s.e.	0.13	0.13
	weighted n (in 1,000s)	1,017	1,600
Marketing	s.e.	0.28	0.23
	weighted n (in 1,000s)	1,017	1,600
Print production	s.e.	0.20	0.40
	weighted n (in 1,000s)	1,017	1,600
Construction	s.e.	0.10	0.23
	weighted n (in 1,000s)	1,017	1,600

See notes at end of table.

Table B56. Standard errors for table A29: Percentage of public high school graduates concentrating in occupational education, by program area and college-preparatory status: 1998—Continued

		College-preparatory	Not college-preparatory
Agriculture	s.e.	0.41	0.67
	weighted n (in 1,000s)	1,017	1,600
Mechanics and repair	s.e.	0.10	0.26
	weighted n (in 1,000s)	1,017	1,600
Protective services	s.e.	‡	0.05
	weighted n (in 1,000s)	1,017	1,600
Materials production	s.e.	‡	‡
	weighted n (in 1,000s)	1,017	1,600
Mixed programs			
Business	s.e.	0.18	0.16
	weighted n (in 1,000s)	1,017	1,600
Precision production	s.e.	0.11	0.27
	weighted n (in 1,000s)	1,017	1,600
Trade and industry	s.e.	0.06	0.27
	weighted n (in 1,000s)	1,017	1,600
Technology	s.e.	0.17	0.09
	weighted n (in 1,000s)	1,017	1,600

‡Reporting standards not met. (Too few cases.).

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School Transcript Study (HSTS), 1998.

Table B57. Standard errors for table A30: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.75	0.94	0.63	0.67	0.56
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.82	0.82	0.67	0.54	0.55
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.33	1.71	1.26	1.45	0.93
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	4.91	3.65	3.26	3.17	1.72
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	5.56	8.16	3.12
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.94	2.20	1.89	1.96	1.51
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	6.88	9.21	4.58	2.37
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	2.65	4.57	3.44	0.72
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	7.01	4.30	3.80	3.11
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	4.74	5.59	5.89	4.51	3.44
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	6.26	11.23	5.41	8.05
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	8.94	6.30	8.03	3.35	1.98
	weighted n (in 1,000s)	15	14	13	21	47
Marketing	s.e.	4.20	3.17	7.24	2.38	1.78
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	3.96	4.93	4.81	4.20	3.11
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	4.24	3.88	4.94	2.78	2.96
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.

Table B57. Standard errors for table A30: Percentage of public high school graduates taking algebra 1 or higher mathematics courses, by occupational concentration status and program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
Other precision production	s.e.	9.11	13.70	‡	7.74	5.12
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	7.10	5.05	6.60	4.13	3.22
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	5.19	2.91	2.98	1.89	1.46
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B58. Standard errors for table A31: Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.87	1.61	1.14	1.56	2.07
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	1.02	1.65	1.26	1.61	2.22
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.19	2.12	1.58	2.07	2.16
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	3.57	2.87	3.14	3.13	4.64
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	10.09	7.00	5.87
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	2.20	3.19	3.20	2.92	4.45
	weighted n (in 1,000s)	242	163	1,049	1,189	85
Child care and education	s.e.	‡	6.78	10.12	4.99	6.76
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	6.93	6.77	6.81	2.82
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	8.83	8.13	5.61	5.48
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	3.00	4.73	5.13	4.44	4.02
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	7.01	9.67	3.08	8.53
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	6.37	6.66	5.76	5.67	4.75
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	4.84	4.08	6.07	4.42	4.80
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	3.45	3.74	3.81	4.29	5.58
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	2.57	3.31	3.81	3.41	4.36
	weighted n (in 1,000s)	80	57	40	36	47
Other precision production	s.e.	8.30	9.14	‡	8.53	11.25
	weighted n (in 1,000s)	11	10	4	3	6

See notes at end of table.

Table B58. Standard errors for table A31: Percentage of public high school graduates taking geometry courses, by occupational concentration status and program area: Various years, 1982–98 —Continued

		1982	1990	1992	1994	1998
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	5.48	4.51	7.57	5.59	7.71
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.77	4.64	5.55	5.04	3.59
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B59. Standard errors for table A32: Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	1.20	1.49	0.79	1.20	0.95
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	1.28	1.19	0.89	1.27	1.04
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	1.69	2.65	1.29	1.56	1.41
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	5.05	3.61	3.09	2.80	3.48
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	6.16	7.43	4.62
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	2.55	3.50	1.96	2.45	3.27
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	5.81	7.88	5.12	4.61
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	2.83	3.08	2.79	2.66
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	6.86	4.21	7.96	3.44
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	5.53	6.95	5.42	3.67	5.95
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	6.18	12.87	7.32	8.66
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	9.30	8.27	5.26	3.00	2.53
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	4.87	4.53	3.30	2.98	2.68
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	4.06	6.55	5.36	5.31	4.56
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	4.38	3.59	5.14	3.83	3.99
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.

Table B59. Standard errors for table A32: Percentage of public high school graduates taking regular or advanced biology courses, by occupational concentration status and program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
Other precision production	s.e.	9.38	14.36	‡	5.95	8.67
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	8.39	5.48	5.85	4.75	7.78
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.57	5.04	5.01	2.16	4.36
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B60. Standard errors for table A33: Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.78	1.22	1.10	1.49	1.52
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.98	1.37	1.28	1.58	1.59
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	0.83	1.26	1.33	1.59	2.12
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	3.06	2.79	4.43	2.66	3.41
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	8.25	6.89	6.75
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.35	2.39	3.24	2.74	3.78
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	4.05	5.51	6.07	6.64
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	7.83	8.84	6.66	4.73
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	9.75	9.49	9.47	5.59
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	1.83	1.63	6.87	3.47	4.24
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	0.85	3.59	1.57	4.22
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	5.45	8.03	6.07	5.51	8.33
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	3.50	3.48	3.75	4.03	5.37
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	1.92	2.84	2.78	2.40	3.36
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	1.30	1.64	1.77	1.91	4.10
	weighted n (in 1,000s)	79	57	40	36	47

See notes at end of table.

Table B60. Standard errors for table A33: Percentage of public high school graduates taking regular or advanced chemistry courses, by occupational concentration status and program area: Various years, 1982–98—Continued

		1982	1990	1992	1994	1998
Other precision production	s.e.	5.66	5.52	‡	5.98	10.90
	weighted n (in 1,000s)	11	10	4	3	6
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	2.60	2.63	6.94	3.32	4.83
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	4.58	2.81	4.94	3.73	3.70
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Table B61. Standard errors for table A34: Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98

		1982	1990	1992	1994	1998
Total	s.e.	0.64	0.98	0.82	1.14	1.24
	weighted n (in 1,000s)	2,607	2,505	2,174	2,213	2,617
Nonconcentrators	s.e.	0.79	1.14	0.95	1.28	1.44
	weighted n (in 1,000s)	1,730	1,810	1,632	1,650	1,963
Concentrators, total	s.e.	0.77	0.61	1.08	0.89	1.73
	weighted n (in 1,000s)	878	696	542	562	654
Agriculture	s.e.	2.94	1.57	1.75	1.11	3.70
	weighted n (in 1,000s)	72	64	50	70	67
Business management	s.e.	‡	‡	‡	1.81	4.42
	weighted n (in 1,000s)	4	4	6	7	11
Business services	s.e.	1.09	1.10	3.02	1.39	2.41
	weighted n (in 1,000s)	242	163	105	119	85
Child care and education	s.e.	‡	1.15	0.00	2.74	3.25
	weighted n (in 1,000s)	5	7	8	13	15
Communications technology	s.e.	‡	7.54	6.20	5.81	6.00
	weighted n (in 1,000s)	3	7	6	8	22
Computer technology	s.e.	‡	8.24	9.16	7.90	5.85
	weighted n (in 1,000s)	7	7	9	6	17
Construction	s.e.	1.73	0.99	1.52	0.73	1.49
	weighted n (in 1,000s)	39	28	26	23	33
Food service and hospitality	s.e.	‡	2.61	0.00	1.92	2.43
	weighted n (in 1,000s)	6	12	8	8	12
Health care	s.e.	3.06	2.40	‡	2.65	12.53
	weighted n (in 1,000s)	15	14	13	21	49
Marketing	s.e.	1.27	0.97	2.21	2.04	1.34
	weighted n (in 1,000s)	46	53	28	48	47
Materials production	s.e.	2.17	1.74	4.64	3.55	2.65
	weighted n (in 1,000s)	79	45	32	25	35
Mechanics and repair	s.e.	1.95	1.11	3.57	0.95	2.38
	weighted n (in 1,000s)	79	57	40	36	47
Other precision production	s.e.	‡	5.99	‡	4.66	16.27
	weighted n (in 1,000s)	11	10	4	3	6

See notes at end of table.

Table B61. Standard errors for table A34: Percentage of public high school graduates taking physics courses, by occupational concentration status and program area: Various years, 1982–98 —Continued

		1982	1990	1992	1994	1998
Other technology	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	2	1	4	1	4
Personal and other services	s.e.	1.48	1.11	0.00	1.15	5.71
	weighted n (in 1,000s)	33	32	29	24	21
Print production	s.e.	2.91	2.85	3.33	2.84	3.84
	weighted n (in 1,000s)	52	45	47	39	52
Protective services	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	‡	1	1	2
Transportation	s.e.	‡	‡	‡	‡	‡
	weighted n (in 1,000s)	1	2	‡	2	2

‡Reporting standards not met. (Too few cases.).

NOTE: Weighted n's for nonconcentrators and concentrators may not sum to totals because of rounding. Details do not sum to the concentrators total, because the table does not include mixed business, mixed precision production, mixed trade and industrial and mixed technology program areas, for which related academic coursework was not identified.

SOURCE: U.S. Department of Education, National Center for Education Statistics, High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and High School Transcript Studies (HSTS), 1990, 1994, and 1998.

Appendix C—Glossary

Academic subjects: The high school academic curriculum is divided into the main subject areas listed below, corresponding to the 1998 revised Secondary School Taxonomy categories (Bradby and Hoachlander 1999). The examples given are not exhaustive of the courses included in each subject area.

> **Mathematics:** Includes courses in general mathematics, consumer mathematics, pre-algebra, algebra 1, geometry, algebra 2 and 3, trigonometry, analytic geometry, mathematical analysis, pre-calculus, calculus, Advanced Placement (AP) calculus, International Baccalaureate (IB) mathematics, probability and statistics, unified mathematics (an integrated course sequence usually taught over 2 or 3 years), and occupationally related mathematics.
>
> **Science:** Includes courses in survey science, biological science (including biology and some specialized courses such as botany, zoology, and anatomy and physiology), chemistry, physics, earth science, physical science, and engineering.
>
> **English:** Includes survey courses (including language skills courses and English 9–12), as well as courses in literature, composition and writing, speech, and English as a Second Language.
>
> **Social studies:** Includes courses in U.S. history, world history, government and politics, economics, behavioral sciences (including psychology and sociology), geography, social studies, American studies, area studies, women's studies, law, anthropology, and philosophy.
>
> **Fine arts:** Includes courses in visual arts, music, dance, and theater arts.
>
> **Foreign (non-English) languages:** Includes courses in Spanish, French, German, Latin, Italian, and other non-English languages and literatures.

Advanced English: Includes honors-level English courses.

Advanced mathematics: Includes coursework in algebra 3, trigonometry, analytical geometry, linear algebra, probability, statistics, pre-calculus, introduction to analysis, and calculus.

Advanced occupational concentrator: Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 credit in a second- or higher-level or cooperative education course in that program area.

Advanced occupational concentrator with cooperative education: Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed in figure 3, with at least 1.0 cooperative education credit in that program area.

Advanced science: Includes coursework in chemistry 1 and 2 and physics 1 and 2.

Carnegie unit: A standard of measurement used for secondary or high school education that represents the completion of a course that meets 1 period per day for 1 year. See **credit**.

College-preparatory coursework: Public high school graduates were classified as completing college-preparatory coursework if they completed 4.0 credits in English; 3.0 credits in mathematics at the algebra 1 level or higher; 2.0 credits in biology, chemistry, and/or physics; 2.0 credits in social studies with at least 1.0 credit in U.S. or world history; and 2.0 credits in a single foreign (non-English) language during high school.

Cooperative education: Programs that allow students to earn course credit for paid or unpaid employment that is related to a specific occupational program of study. In contrast, **general work experience** is not connected to a specific occupational program.

Core academic standards: See **New Basics core academic standards**.

Core academic subjects: Includes mathematics, science, English, and social studies, as defined under **academic subjects**.

Credit: Term used in place of a "Carnegie unit" to represent the completion of a course that meets 1 period per day for 1 year. See **Carnegie unit**.

Curriculum types: At its most aggregated level, the 1998 revised Secondary School Taxonomy divides the high school curriculum into the following curricula (excluding special education):

> **Academic:** See **academic subjects**.
>
> **Vocational/technical:** See **vocational/technical education**.
>
> **Enrichment/other:** See **enrichment/other**.

Enrichment/other: Includes courses designed for students' personal enrichment, including courses in general skills; health, physical, and recreation education; religion and theology; and military science.

Family and consumer sciences education: Consists of courses intended to prepare students for roles outside the paid labor market, including home economics, child development, foods and nutrition, and clothing. Home economics-related courses that prepare students for the paid labor market are included under **occupational education**, in the child care and education, food service and hospitality, and personal and other services program areas.

General labor market preparation: Consists of courses that teach general employment skills but do not have as their primary objective preparing students for paid employment in a specific field. These courses include typewriting, word processing, industrial arts, career exploration, general work experience, and technology education.

General work experience: Programs that allow students to earn course credit for paid or unpaid employment. Unlike **cooperative education**, general work experience is not connected to a specific occupational program of study.

New Basics core academic standards: In the 1983 publication *A Nation at Risk,* the National Commission on Excellence in Education recommended that all high school students take 4 years of English; 3 years each of mathematics, science, social studies; and one-half year of computer science. The "core academic standards" referred to in this report include the recommendations for English, mathematics, science, and social studies.

Occupational concentrator: Graduate earning 3.0 or more credits in high school in one of the 10 broad occupational program areas listed under **occupational programs**. In some cases, the report also examines trends in concentrating (earning 3.0 or more credits) in the 18 narrow occupational program areas listed under **occupational programs**.

Occupational coursetaker: Graduate earning greater than 0.0 credits in occupational education in high school.

Occupational education: Also called **specific labor market preparation**, consists of courses that teach skills and provide information required in a particular occupation or cluster of occupations. Courses are organized into 10 broad and 18 narrow occupational program areas. See **occupational programs**.

Occupational home economics-related programs: Includes coursework in food service and hospitality, child care and education, and personal and other services.

Occupational investor: Graduate earning 3.0 or more credits in occupational education in high school, regardless of whether the graduate concentrates his or her occupational coursetaking in a single occupational program area.

Occupational programs: The 1998 Secondary School Taxonomy organizes high school occupational programs into the following 10 broad and 18 narrow program areas. The examples given are not exhaustive of the courses offered in each area. See also figure 3.

> **Agriculture (and renewable resources):** Includes courses in agricultural mechanics, horticulture, animal sciences, and environmental management.
>
> **Business:** Includes the following two narrow program areas of business management and business services:
>
>> **Business management:** Includes courses in business and management and banking and finance.
>>
>> **Business services:** Includes courses in bookkeeping, accounting, data entry, secretarial administration, and office procedures.
>
> **Marketing:** Includes courses related to the selling and distribution of goods and services, including distributive education, distribution and marketing, fashion merchandising, and entrepreneurship.
>
> **Health care:** Includes courses intended to prepare students for careers in the health professions, such as health occupations, dental assistant, medical laboratory technologies, and practical nursing.
>
> **Protective services (and public services):** Includes courses in criminal justice, fire protection, public administration, and social work.
>
> **Trade and industry:** Includes the following four narrow program areas of construction, mechanics and repair, precision production, and transportation:
>
>> **Construction:** Includes coursework in electricity, masonry, carpentry, plumbing, and building construction.
>>
>> **Mechanics and repair:** Includes coursework in industrial mechanics, radio and TV repair, air conditioning and heating, power mechanics, auto mechanics, and aviation powerplant.

Precision production: Includes the following three narrow program areas of print production, materials production, and other precision production:

Print production: Includes coursework in drafting, graphics, and printing.

Materials production: Includes coursework in metals, plastics, and woodworking.

Other precision production: Includes coursework in electronics, leatherwork, meatcutting, and commercial photography.

Transportation: Includes coursework in aeronautics, aviation technology, marine mechanics, transportation technology, and vehicle and equipment operation. Also referred to as transportation and materials moving.

Technology: Includes the following three narrow program areas of computer technology, communications technology, and other technology:

Computer technology: Includes coursework in computer applications, computer programming, data processing, computer science and systems, and computer mathematics.

Communications technology: Includes coursework in broadcast management, film making, and radio and television production.

Other technology: Includes coursework in electronic technology, industrial production technology, chemical technology, and engineering technologies.

Food service and hospitality: Includes coursework in food marketing/distribution, hospitality sales, culinary arts, and hotel management.

Child care and education: Includes coursework in child care services, child development, education, and library science.

Personal and other services: Includes coursework in cosmetology, building and grounds maintenance, clothing and textiles, housing and interior design, and home economics occupations.

Specific labor market preparation: Also called **occupational education**, consists of courses that teach skills and provide information required in a particular occupation or cluster of occupations. Courses are organized into 10 broad and 18 narrow occupational program areas. See **occupational programs**.

Vocational/technical coursetaker: Graduate earning greater than 0.0 credits in vocational/technical education in high school.

Vocational/technical education: Organized educational programs, services, and activities that are directly related to the preparation of individuals for paid or unpaid employment or for additional preparation for a career that requires other than a bachelor's or an advanced degree. This publication refers to the following three types of vocational education at the high school level: **family and consumer sciences education**, **general labor market preparation**, and **specific labor market preparation** or "**occupational education**."

Vocational/technical investor: Graduate earning 3.0 or more credits in vocational/technical education in high school.

Appendix D—Technical Notes and Methodology

Sources of Data

The data for this report came from five surveys conducted by NCES between 1982 and 1998. These surveys are the High School and Beyond (HS&B) Sophomore Cohort, First Follow-up Survey and High School Transcript Study, 1982; the National Education Longitudinal Study of 1988 (NELS:88), Second Follow-up Survey and High School Transcript Study, 1992; and the National Assessment of Educational Progress (NAEP) High School Transcript Studies (HSTS) of 1990, 1994, and 1998.

For all transcripts and samples used in this report, a course identification code number, based on the Classification of Secondary School Courses (CSSC), was assigned to each course taken by a student. *The 1998 Revision of the Secondary School Taxonomy* (Bradby and Hoachlander 1999) further classified these CSSC codes. This taxonomy served to standardize all transcript data included in the analysis.

The analysis sample from each survey was restricted to a subset of students who were public high school graduates and who had a complete set of transcripts. A complete transcript was defined as one that recorded 16 or more total credits (Carnegie units), with a positive, non-zero number of credits completed in English.

One additional step was taken to ensure that the analysis samples were comparable across the 5 trend years. This was necessary because the HS&B and NELS studies excluded students with the most severe disabilities, where it was determined by school staff that these students were unable to complete the lengthy student questionnaires that were a part of these longitudinal studies. In order to ensure comparability, graduates with special education diplomas were excluded from the HSTS samples. This procedure was first determined by Gifford et al. (1989) and then again by Tuma (1996) to produce comparable samples across HS&B, NELS, and HSTS. Thus, the samples used for this trend analysis were consistent with the population of public high graduates, including students with disabilities, who earned regular or honors diplomas in each of the study years. This restriction is consistent with NCES reports on high school vocational/technical coursetaking published over the last decade and is consistent with NCES procedures for transcript studies (Alt and Bradby 1999).

In addition, there are some minor coding differences between NELS and the other transcript data that may affect the data for 1992. NCES plans to study this issue. The following section provides a brief description of each study.

High School and Beyond

The High School and Beyond (HS&B) longitudinal survey was first administered in 1980 to a stratified, nationally representative sample of approximately 30,000 high school sophomores and 28,000 high school seniors from more than 1,000 high schools. Follow-up surveys were administered in 1982, 1984, 1986, and 1992. This report focused on the sophomore cohort from the First Follow-up Survey conducted in 1982. For purposes of this report, the analysis sample was limited to public high school students using the variable HSTYPE. This group was reduced further by including only high school graduates, defined by using a composite of graduation status variables RESNLEFT, FUSTTYPE, and SY12 from the Transcript, First Follow-up and Second Follow-up surveys, respectively.

The First Follow-up and High School Transcript Study were used to examine coursetaking patterns. The analysis sample included 9,598 public high school students who graduated in 1982 and had complete transcripts available. Standard errors were computed using the Taylor series approximation method. More information on the First Follow-up and Transcript data files can be found in *High School and Beyond, 1980 Sophomore Cohort, First Follow-Up (1982), Data File User's Manual* (Jones et al. 1983) and *High School and Beyond Transcripts Survey (1982), Data File User's Manual* (Jones et al. 1984).

National Education Longitudinal Study of 1988

The National Education Longitudinal Study of 1988 (NELS:88) is another major longitudinal study sponsored by NCES. The Base Year Survey was administered to about 24,000 8th-graders in more than 1,000 schools with an 8th-grade class. The First, Second, Third, and Fourth Follow-ups revisited the same sample of students in 1990, 1992, 1994, and 2000, when most of the 1988 8th-graders were in the 10th grade, 12th grade, and then, 2 and 6 years after they graduated from high school. Unlike HS&B, for each in-school follow-up (i.e., 1990 and 1992), the student sample was "freshened" to obtain a representative, cross-sectional grade-cohort sample (i.e., 10th-graders in 1990 and 12th-graders in 1992). In addition, as a part of the Second Follow-up Survey, high school transcripts were collected for the members of the 12th-grade cohort in the fall of 1992. Transcript data were available for about 17,200 students. For purposes of this report, the analysis sample was limited to public high school students using G12CTRL2. This group was reduced further by including only high school graduates using the variable F2REASL.

The report used the Second Follow-up and High School Transcript Study to examine coursetaking patterns. The analysis sample included 11,788 public high school students who graduated in 1992 and had complete transcripts available. Standard errors were computed using the Taylor series approximation method. For more information on the Second Follow-up Survey of NELS:88, see *Second Follow-up: Transcript Component Data File User's Manual* (Ingels et al. 1995).

NAEP High School Transcript Studies of 1990, 1994, and 1998

This report used three NAEP transcript studies conducted in 1990, 1994, and 1998. The NAEP is a congressionally mandated assessment program conducted by the National Center for Education Statistics in the Institute of Education Sciences, U.S. Department of Education. The overall goal of NAEP is to determine the nation's progress in education. Conducted in association with NAEP, the High School Transcript Studies (HSTS) provided coursetaking and demographic information for a stratified, nationally representative sample of high school seniors. The 1990 transcript file included the high school transcripts of 21,531 seniors from about 330 schools, while the 1994 transcript file included the high school transcripts of 24,844 seniors from 340 schools. The 1998 HSTS collected transcript data from 25,422 seniors in 264 high schools. Like HS&B and NELS:88, the availability of complete high school transcripts and students' graduation status defined the NAEP student samples included in this report. To assure comparability with the samples from HS&B and NELS:88, only public high school seniors who graduated with a "regular" or "honors" diploma were included, using the variable EXSTAT.

The final analysis samples were 16,507 for 1990; 23,706 for 1994; and 23,176 for 1998. Standard errors were computed using the jackknife replication method. For further information about NAEP High School Transcript Studies, see *The 1994 High School Transcript Study Tabulations: Comparative Data on Credits Earned and Demographics for 1994, 1990, 1987, and 1982 High School Graduates (Revised)* (Legum et al. 1998), and *The 1998 High School Transcript Study User's Guide and Technical Report* (Roey et al. 2001).

Description of Academic Pipeline Measures

In each data set described above, composite coursetaking measures in mathematics, science, and English were constructed based on the transcripts of public high school graduates collected as part of HS&B, NELS:88, and NAEP. These measures place students in different levels of an academic "pipeline."[85] The pipeline generally organizes courses in each subject based on the normal progression and difficulty of courses within that subject area. For example, in mathematics, algebra 1 is less difficult than and is traditionally taken before algebra 2; thus, algebra 1 is placed lower in the pipeline hierarchy than is algebra 2. In addition, the pipeline classifies graduates by the highest level of courses completed in a subject area, not the highest level attempted. Thus, the pipeline for a subject can be used to assess the rigor and difficulty of courses that high school graduates have completed during high school. Graduates at the high end of a pipeline have completed more advanced coursework than graduates at a lower level of the pipeline.

For purposes of this report, the original pipeline measures were condensed into fewer categories that were more relevant for an analysis of participation in vocational/technical education. The following section describes how the pipeline measures used in this report were constructed for mathematics, science, and English. For more information on the construction of the original pipeline measures, see *Mathematics, Foreign Language, and Science Coursetaking and the NELS:88 Transcript Data* (Burkam, Lee, and Smerdon 1997) and *English Coursetaking and the NELS:88 Transcript Data* (Burkam 1998).

Mathematics Pipeline

The original mathematics pipeline had eight levels: No mathematics, Nonacademic, Low academic, Middle academic I, Middle academic II, Advanced I, Advanced II, and Advanced III. The condensed mathematics pipeline used in this report contained four categories: the first three levels were collapsed into "low mathematics" and the last three levels into "advanced mathematics." The middle two levels were kept as originally defined. The types of coursework used to define the four condensed categories are described below.

Low mathematics. Includes students who completed no mathematics; remedial-level mathematics; general, basic or consumer mathematics; technical or vocational mathematics; and low-level "academic" mathematics, such as pre-algebra, algebra 1 taught over the course of 2 academic years, or informal geometry; and who completed no mathematics in higher pipeline categories.

Lower-middle mathematics. Includes students who completed algebra 1; plane and/or solid geometry; or unified mathematics 1 and/or 2; but no higher mathematics.

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[85] Researchers at the University of Michigan using the NELS:88 transcript file first developed these pipeline measures (Burkam, Lee, and Smerdon 1997 and Burkam 1998). Following the concept and logic of these original measures, Pinkerton Computer Consultants created similar pipeline variables using the HS&B and NAEP data files.

Upper-middle mathematics. Includes students who completed algebra 2 or unified mathematics 3, but no higher mathematics.

Advanced mathematics. Includes students who completed algebra 3; trigonometry; analytical geometry; linear algebra; probability; statistics; pre-calculus; introduction to analysis; or calculus.

Science Pipeline

Unlike mathematics and other subjects such as foreign languages, coursework in science does not follow a common or easily defined sequence. Depending on a school's curriculum, students may be able to choose from several courses with minimal sequencing. Consequently, the method used to construct the original science pipeline differed from that of the mathematics pipeline. First, all science courses were placed in one of four groups based on subject matter: 1) life science (biology); 2) chemistry; 3) physics; and 4) all other physical sciences (for example, geology, earth science, and physical science). Second, a pipeline was constructed for each of these four groups. Third, the pipelines for chemistry, physics, and all other physical sciences were combined into a single pipeline. The result was a pipeline with seven levels: no science; primary physical science; secondary physical science; biology; chemistry I or physics I; chemistry I and physics I; and chemistry II or physics II.

For purposes of this report, this science pipeline was condensed into three categories. The first three categories were collapsed into "low science" and the last three into "advanced science." The middle biology category was kept as originally defined. The types of coursework used to define the three condensed categories are described below.

Low science. Includes students who completed no science courses; remedial-level science; physical science; earth science; unified science; astronomy; geology; environmental science; oceanography; general physics; basic biology 1; or consumer or introductory chemistry; but no higher science.

Biology. Includes students who completed at least one of the following courses: general biology 1; secondary life sciences (including ecology, zoology, marine biology, and human physiology); general or honors biology 2; or advanced biology, but no higher science.

Advanced science. Includes students who completed one of the following combinations of chemistry and physics: chemistry 1 or physics 1; chemistry 1 and physics 1; or chemistry 2 or physics 2.

English Pipeline

English language and literature courses also do not fit neatly into an ordered hierarchical framework. While the mathematics curriculum adds more challenging content to the content studied earlier, the hierarchy in the English curriculum is different. In general, the English curriculum is stratified by the level of difficulty and intensity of work required within a specific content area rather than among different courses. Within each area (such as literature or composition), the courses can be classified according to three tracks: below-grade courses, at-grade courses, and above-grade or honors courses. The original English pipeline was constructed to reflect the proportion of coursework students completed in each track. For example, the lowest category in the original English pipeline included students who completed 75 percent or more of their English coursework in low-level courses (below grade), and the highest category included students who completed 75 percent or more of their English courses at the honors level. Hence, the English pipeline departed somewhat from the "pipeline" concept that was developed for mathematics and science. It reflected the quality (or rigor) of a student's English coursetaking rather than the progression from low-level to more challenging coursework. Using the proportion of coursework students completed in different tracks, a student's overall English coursetaking was classified into seven categories.

For purposes of this report, the original English pipeline was condensed into three categories. The first three levels were collapsed into "low English" and the last three into "advanced English." The middle category was defined as in the original pipeline, and was labeled "other English."

Low English. Includes students who completed at least some English coursework in low-level courses.

Other English. Includes students who completed no honors and no low-level English coursework.

Advanced English. Includes students who completed at least some English coursework in honors courses.

Accuracy of Estimates

The estimates in this report are derived from samples and are subject to two broad classes of error—nonsampling errors and sampling errors. Nonsampling errors occur not only in sample surveys but also in complete censuses of entire populations. Nonsampling errors can be attributed to a number of factors: inability to obtain complete information about all students in all institutions in the sample (some students or institutions refused to participate, or students participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, sampling, and imputing missing data. Although nonsampling errors due to questionnaire and item nonresponse can be reduced somewhat by adjusting sample weights and imputation procedures, correcting all the forms of nonsampling errors that may be operating, or gauging the effects of these errors, is usually difficult.

Sampling errors occur because observations are made only on samples, not on entire populations. Surveys of population universes are not subject to sampling errors. Estimates based on a sample will differ somewhat from those that would have been obtained by a complete census of the relevant population using the same survey instruments, instructions, and procedures. The standard error is a measure of the variability due to sampling when estimating statistics. Standard errors can be used as a measure of the precision expected from a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.96 standard errors below to 1.96 standard errors above a particular statistic would include the true population parameter being estimated in about 95 percent of the samples. In addition, the standard errors for two sample statistics can be used to determine the precision of the difference between the two statistics and thus to determine whether the sample difference is large enough so that it can be assumed to represent a difference in the population.

Because HS&B, NELS:88, and NAEP data were collected using complex sampling designs, the sampling errors of the estimates from these surveys are typically larger than would be expected if the samples were simple random samples and the observations were independent and identically distributed random variables. Not taking the complex sample designs into account can lead to an underestimate of the sampling variance associated with an estimate. In order to generate accurate standard errors for the statistics reported in this study, the Taylor series approximation method and jackknife replication method were used. In particular, standard errors of estimates from the HS&B and NELS:88 data were computed using the Taylor series approximation and standard errors of estimates from the NAEP data were computed using the jackknife replication method. For more information about these methods, see Wolter (1985).

Statistical Procedures

The comparisons in the text have all been tested for statistical significance to ensure that differences are larger than those that might be expected due to sampling variance. Two types of statistical tests have been used and reported in the text.

Testing the difference between two means or percentages. The Student's t statistic was used to test the likelihood that the differences between two independent means or percentages were larger than would be expected due to sampling error. The Student's t values can be computed for comparisons using the estimates in the report's tables with the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{(se_1)^2 + (se_2)^2}} \qquad (1)$$

where E_1 and E_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. This formula is valid only for independent estimates. When the estimates are not independent (for example, when comparing any estimates that are parts of a percentage distribution), a covariance term must be added to the denominator of the t-test formula. Because the actual covariances were not known, it was assumed that the estimates were perfectly negatively correlated. Consequently, $2*(se_1*se_2)$ was added within the square root of the denominator of the t-test formula for dependent estimates.

Testing the difference between differences. Another statistical test used in this report assessed the difference between two difference estimates. For example, to test whether the difference between occupational concentrators and nonconcentrators in a specific year (e.g., 1982) differed significantly from the difference between these two groups in another year (e.g., 1998), a test of differences between differences was performed using the following formula:

$$t = [(E_{11}-E_{21})-(E_{12}-E_{22})] \,/\, sqrt[(se_{11}^2+se_{21}^2)+(se_{12}^2+se_{22}^2)] \qquad (2)$$

where E_{11} and E_{21} are the estimates for the two comparison groups at time 1 (e.g., E_{11}-E_{21} is the difference between concentrators and nonconcentrators in 1982), E_{12} and E_{22} are the estimates for the two comparison groups at time 2 (e.g., E_{12}-E_{22} is the difference between concentrators and nonconcentrators in 1998), and se_{11}, se_{21}, se_{12}, and se_{22} are their corresponding standard errors.

Generally, whether a difference is considered statistically significant is determined by calculating a t value for the difference, and comparing this value to published tables of values at certain critical levels, called *alpha* levels. The *alpha* level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not. The *alpha* level used in this report is .05; differences discussed in the text have been tested and found significant at this level. Two-tailed tests were performed.

In order to make proper inferences and interpretations from the statistics, several points must be kept in mind. First, comparisons resulting in large t statistics may appear to merit special consideration. However, this is not always the case because the size of the t statistic depends not only on the observed differences between the two estimates being compared but also on the standard error of the difference. Thus, a small difference between two groups with a much smaller standard error could result in a large *t* statistic, but this small difference is not necessarily noteworthy.

Second, when multiple statistical comparisons are made, it becomes increasingly likely that a finding of a statistically significant difference is erroneous. Even when there is no difference for a particular comparison in the population, at an *alpha* level of .05, there is still a 5 percent chance of concluding that an observed *t* value representing one comparison in the sample is large enough to be statistically significant. As the number of comparisons increases, so does the risk of making such an error in inference.

To guard against errors of inference based upon multiple comparisons, the Bonferroni procedure to correct significance tests for multiple contrasts was used, where appropriate, in this report. This method corrects the significance (or *alpha*) level for the total number of contrasts made with a particular classification variable. For each classification variable, there are K possible contrasts (or nonredundant pairwise comparisons), where K=(N*(N–1)/2) and N is the number of categories in the variable (e.g., because the English pipeline has 3 categories (N=3), there are (3*2)/2=3 possible comparisons among the categories). The Bonferroni procedure divides the *alpha* level for a single *t* test (for example, .05) by the number of possible pairwise comparisons in order to provide a new *alpha* level that adjusts for all possible multiple comparisons.

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